

Exhibit 14

[PUBLIC VERSION - REDACTED]

TABLE OF CONTENTS

I. PROFESSOR NOLL’S NEW ANALYSES DO NOT SOLVE THE FUNDAMENTAL PROBLEMS INHERENT IN HIS REGRESSIONS - 2 -

A. Professor Noll Does Not Correct for Correlation of Residuals within Groups or Clusters in His New Regression - 4 -

B. In His New Regressions, Professor Noll Used the Wrong But-for World - 8 -

C. Although Professor Noll Changed the Specification of his Model, he Failed to Include a Number of Characteristics in his New Regressions that are Important in Explaining the Price of iPods..... - 10 -

1. The Omitted iPod Characteristics are Important in Explaining the Variance in iPod Prices - 10 -

2. Adding our Characteristics to Professor Noll’s Regressions does not Result in “Extreme Multicollinearity” - 12 -

3. Professor Noll’s New Regressions Suffer from Omitted Variable Bias..... - 13 -

II. PROFESSOR NOLL’S REBUTTAL REPORT INTRODUCES A NEW THEORY OF IMMEDIATE IMPACT - 13 -

LIST OF APPENDICES

APPENDIX A: Curriculum Vitae (Kevin M. Murphy)

APPENDIX B: Curriculum Vitae (Robert H. Topel)

APPENDIX C: List of Materials Relied Upon

APPENDIX D: Revised regression results

1. Our names are Kevin M. Murphy and Robert H. Topel. Each of us has previously submitted a report in this matter in response to the *Declaration of Roger G. Noll on Liability and Damages*, April 3, 2013 (hereinafter “Noll merits report”).¹ We have now been asked by counsel for Apple Inc. (“Apple”) to review the *Rebuttal Declaration of Roger G. Noll on Liability and Damages*, November 25, 2013 (hereinafter “Noll rebuttal declaration”) and to respond to the new theories, opinions, analyses, models, and exhibits contained therein. Our qualifications to serve as economic experts are detailed in our previous reports and our *curricula vitae*. The matters in which we have submitted expert reports and/or been deposed since the time at which we filed our original reports are listed in our *curricula vitae*, which are attached to this report as Appendices A and B, respectively. Our *curricula vitae* also contain current lists of our publications.

2. In Professor Noll’s rebuttal declaration, among other things, he offers new opinions, analyses, regressions and damages estimates, and exhibits that were not in his merits report. We’ve been asked by Apple to address this new material. In this report, we confine our opinions to this new material. At times it is necessary to summarize some of our earlier work in order to provide context. Where Professor Noll restates opinions with which either of us disagrees or where he merely defends the opinions in his merits report, we do not restate our opinions here or otherwise respond to his defenses. The fact that we do not respond to every point in Professor Noll’s rebuttal declaration should not be read as an indication that we agree with any part of his opinions. We reserve the right to respond, and anticipate responding, to each point that he has raised in his rebuttal declaration.

3. This report sets forth our opinions and describes the bases for those opinions as well as the data and analyses that underlie them. In preparing this report, we have reviewed Professor Noll’s rebuttal declaration, together with his exhibits and appendices and the materials cited therein. We have also reviewed the documents and publications listed in the footnotes to this report. In performing our additional analyses and preparing the materials and exhibits contained in this report, we have been assisted by our colleagues at Charles River Associates,

¹ See Expert Report of Kevin M. Murphy, August 19, 2013 (hereinafter “Murphy report”) and Expert Report of Robert H. Topel, August 19, 2013 (hereinafter “Topel report”); See Also Supplemental exhibits for Kevin M. Murphy (November 11, 2013); Supplemental exhibits for Robert H. Topel (November 8, 2013); Expert Report of Roger Noll, April 3, 2013; Noll Corrected Declaration, May 31, 2013.

International. The list of additional materials we have considered is attached to this report as Appendix C.

I. PROFESSOR NOLL'S NEW ANALYSES DO NOT SOLVE THE FUNDAMENTAL PROBLEMS INHERENT IN HIS REGRESSIONS

4. In his rebuttal report, Professor Noll presents new regressions that attempt to estimate an “overcharge” on the price of iPods. In response to our criticisms, he now uses quantity weights rather than frequency weights to account for some of the correlation among the error terms, changes the measure of time from a logarithmic to a scalar variable, changes the date on which the iTS adopted DRM-free format, and adds a variable to indicate the date on which Harmony was re-launched in April 2005. He has also changed the way in which he treats his indicator variables for iTunes 4.7 and 7.0. Previously he turned on (set to 1) the iTunes 7.0 indicator and turned off (set to zero) the iTunes 4.7 indicator for all iPods as of September 2006, when iTunes 7.0 was released. Now he turns on the iTunes 7.0 indicator and turns off the iTunes 4.7 indicator for only those iPods that included the [REDACTED]

5. As discussed more fully below, Professor Noll's new regressions do not address fundamental errors that rendered his first regression unreliable.

- a) First, although he now uses quantity weights, the error terms in his new regressions remain highly correlated within clusters or groups. One must correct for this correlation in calculating the precision of estimates, but Professor Noll simply ignores the problem. Correcting for this correlation using standard and accepted econometric methods, we show that his estimates of impact and damages are not statistically significant, i.e, they are statistically indistinguishable from zero.
- b) Second, by turning off iTunes 4.7 he assumes the wrong but-for world.
- c) Third, he fails to include important characteristics that explain price in his regression.²

² The effect of omissions such as these is generally called “omitted variable bias.” See *A Guide to Econometrics (Fifth Edition)* by Peter Kennedy, Chapter 6.2 (1) (a-c), at p 107-108, MIT Press, 2003.

6. Once these flaws are corrected, Professor Noll's new statistical analysis provides no evidence of impact or damage. Although none of the estimated effects of 7.0 are statistically significant once these corrections have been made, we have nevertheless used the coefficients to re-estimate "damages" in order to show how sensitive his damages estimates are to these changes.³ The results of this exercise are shown in Exhibits JT-1a and JT-1b. Once corrected, even Professor Noll's otherwise flawed model shows that there are no damages.

7. As mentioned above, Professor Noll changed his treatment of the iTunes 4.7 and iTunes 7.0 variables. As discussed more fully below, his treatment is at odds with plaintiffs' theory and his earlier deposition testimony.⁴ To demonstrate the sensitivity of Professor Noll's model, we adjust his new model using his original treatment of 4.7 and 7.0, i.e., we turn on the indicator variable for iTunes 7.0 and turn off the indicator variable for iTunes 4.7 for all models on September 9, 2006. (See Exhibits JT-2a and JT-2b.) [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

³ As with his previous analysis, the damages calculations in Professor Noll's rebuttal report were based on an incorrect but-for price. In particular, he applies the alleged overcharge that he estimates to the actual price in the marketplace, which would include the alleged overcharge, if any. Professor Noll recognized this error in his deposition. See Noll Deposition, December 18, 2013, at pp.17:20-18:3. We have corrected this in our analysis and will continue to use the corrected but-for price in our calculations without further comment.

⁴ See, e.g., Professor Noll's deposition testimony of May 16, 2013 in which he said: ". . . the effect of 7.0 on price is not necessarily limited to just the products that were sold that had 7.0 in them." See May 16, 2013 deposition at pp 46:2 to 46:4. And, talking about the appropriate treatment of the iTunes 7.0 indicator variable: "If you did it only for the one that had 7.0 on them, it would be because you thought that the effect was limited to just the products that had 7.0 loaded. If you, instead, did it for all products, it was because you thought that the most important effect was knocking Harmony out of the market. And I – I think that the latter is actually correct." (*ibid* at pp. 48:24-49:6) And a little later: "So I think that's the right way to do it."(*ibid* at pp. 49:14).

⁵ By proper but-for world, we mean a world in which the iTunes 4.7 variable is not turned off at the time of iTunes 7.0.

A. Professor Noll Does Not Correct for Correlation of Residuals within Groups or Clusters in His New Regression

8. As Professor Noll recognizes, a fundamental assumption in regression analyses is that the error terms are independent, not correlated.⁶ As we showed, this assumption was violated in his original regressions.⁷ There were two underlying reasons for this. First, because Professor Noll used frequency weighting in his analysis, he repeatedly created thousands of *identical* observations when there was really only one. Second, even after removing that source of correlation, the error terms on price observations for a given iPod at a given time (a “cluster” of transactions) remain correlated because they are affected by many of the same economic forces.⁸ This high correlation can be observed directly in the data. As mentioned above, he fixed his first error by changing from frequency weighting to quantity weighting. He has done nothing, however, to correct for the remaining high correlation of error terms within clusters in his new regression. His insistence that clustering is not an issue in his new regression is, as a matter of econometrics and statistics, simply wrong.

9. Once the correlation of error terms within clusters is corrected in his new regression, Professor Noll’s results are not statistically significant. That is, they cannot be distinguished from zero by accepted scientific standards and so they provide no reliable evidence of impact. Exhibits JT-1a and JT-1b (and also Appendices D2a and D2b) show the results of clustering by family and quarter, i.e., of taking the correlation in the error terms into account for Professor Noll’s reseller regression and direct sales regression, respectively. Column 1 reproduces the results of Professor Noll’s preferred specification as presented in Noll Exhibits 3A and 3B. Column 2 reproduces the results in Column 1, but correcting for correlation within clusters. As Column 2 shows, the standard error of the coefficient on the iTunes_7 variable increases dramatically from 0.0006 to 0.0407, and the corresponding t-statistic has decreased just

⁶ See Noll rebuttal declaration 36; Noll Deposition, December 18, 2013, at pp.23:18-23; See also Murphy report at ¶¶95-96 and Topel report ¶¶74-75. If the error terms are not independent, the regression coefficients will appear to be much more statistically significant than they actually are.

⁷ See Exhibits 15a and 15b, and ¶¶95-96 from the Murphy report and Exhibits 11 and ¶¶74-75 from the Topel report.

⁸ [REDACTED]

as dramatically (from 37.599 to 0.577).⁹ The other standard errors have increased just as dramatically, reflecting the fact that Professor Noll has vastly overstated the precision of his (otherwise flawed) regressions.¹⁰ This is clear evidence of the need to cluster. As stated in the American Bar Association's reference volume *Proving Antitrust Damages (2010)*, standard methods of adjusting for clustering "produce consistent estimates of the standard errors even when there is no correlation among the error terms. In other words, they work well in both situations." If Professor Noll's assertions had been correct, the standard errors would not increase the way they do, but would, instead remain approximately the same.¹¹ The *fact* that clustering dramatically changes the results of Professor Noll's regressions is itself concrete proof that he is wrong.

10. Professor Noll admitted that there are standard statistical tests to determine whether the independence assumption is valid -- i.e., whether the errors are independent.¹² However, he conducted none of those tests, relying instead on blind faith that "this is not a clustering problem."¹³ In our original reports, we presented evidence that the errors Professor Noll's original regressions were correlated within groups or clusters.¹⁴ (See Exhibits 15a and 15b in the Murphy report and Exhibits 13a and 13b in the Topel report.) Here we repeat that

⁹ These results are for the reseller regression. In the direct sales regression the standard error increased from 0.0002 to 0.0468, and the t-statistic decreased from 448.7 to 1.5.

¹⁰ The standard errors in Professor Noll's new regressions are substantially larger than the standard errors in his old regressions, but they are still small. They are so small, in fact, that Professor Noll's claims of precision and statistical significance cannot possibly be true. See, e.g., discussion in Topel report at ¶65.

¹¹ See ABA SECTION OF ANTITRUST LAW, *PROVING ANTITRUST DAMAGES: LEGAL AND ECONOMIC ISSUES* (2D Ed. 2010), at p 46-47.

¹² Indeed, in his rebuttal report he criticizes us for purportedly not examining whether the mean residual errors within clusters are statistically significantly different from zero. See Noll rebuttal declaration, at p 33 and 34.

¹³ See Noll Deposition, December 18, 2013, at pp 186:6-187:22.

¹⁴ Professor Noll suggests that clustering by product family and time is unwarranted, but his reasoning is flawed. Including fixed effect for cluster-specific groups does not obviate the need to cluster. See A Practitioner's Guide to Cluster-Robust Inference, by Colin Cameron and Douglas L. Miller (Department of Economics, University of California - Davis), October 15, 2013, at p. 16. Second, with respect to clustering by quarter, Professor Noll has not provided any evidence that there are no unobserved common factors specific to different quarters, even adjacent ones. Moreover, to the extent that Professor Noll is suggesting that quarters may be "too short" for there to be such unobserved common factors, he fails to recognize that it is *conservative* for us to adopt a shorter time period for since this may leave some residual correlation between the error terms in one period to the next, and thus our standard errors would be underestimated. However, for the sake of completeness, we have rerun our analyses, clustering over product family. The results are presented in Exhibits JT-3a and JT-3b.

same analysis for his new regressions, and we find that correlation among the error terms remains.¹⁵ (See Exhibits JT-4a and JT-4b.) As before, we used the parameter estimates from Professor Noll's regressions to calculate the estimated residual for each of the transactions in the reseller database. Then, within each family and quarter, we divided the residuals into two equal-size groups and calculated the average residual within the group.¹⁶ If Professor Noll is correct in his assumption that his observations are independent, then the residuals in the two groups should be independent. In particular, the average residual within each group should be close to zero, and the residuals from each of the two groups should be uncorrelated with one another. As with his earlier regressions, neither of these assumptions holds true. The mean residuals are not grouped around zero, but rather they range from -0.485 to 0.347 for the reseller regression and from -0.692 to 0.273 for the direct regression.¹⁷ Moreover, they are strongly positively correlated.¹⁸ This is the reason that correcting for the correlations within clusters so dramatically changes his results—his unfounded assumption that the residuals are independent is wrong.

11. Professor Noll (now) recognizes that the central question is whether the regression residuals are correlated, but he continues to insist that he does not need to correct for such correlation. His principal arguments for this are presented below, together with our comments on each

- a) "First, there is no evidence that the residual errors are correlated within a group of transactions for a given model of iPod in a given calendar quarter."¹⁹ This is demonstrably incorrect. Our analysis of Professor Noll's new regressions shows conclusively that the error terms are correlated.

¹⁵ See, e.g., Topel report at ¶29.

¹⁶ We did this for both the Reseller Sales and Direct sales regressions.

¹⁷ This is illustrated by the fact that the data points on the graph do not fall neatly into a small area in the middle (grouped around the co-ordinates 0,0), but rather fall generally in places on the graph other than right around 0,0.

¹⁸ This is exactly what is illustrated by our graphs. The 45-degree line indicates the place on the graph at which one would expect to see all of the paired residuals fall if they were perfectly correlated. While this is clearly not the case, the fact that the indicators for each of the pairs lie so close to the 45-degree line is shows that the within-cluster residuals are highly correlated.

¹⁹ See Noll rebuttal declaration at 46.

- b) “Second, the regressions on iPod transactions were not a sample of types of iPods, but are based on all transactions. Thus, the iPod data require no correction to adjust for sampling.”²⁰ Whether the regressions are based on a sample or a database consisting of all transactions is irrelevant. The issue is not whether you have “all” of the data or merely a sample, but whether the residuals in the statistical model assumed by Professor Noll are correlated. When they are, accuracy requires that one account for the correlation.²¹ Professor Noll’s assertion that one need not account for the stochastic properties of the data caused by “sampling” is wrong. As pointed out in Russell Davidson and James MacKinnon, *Econometric Theory and Methods (2004)*:
- “It is common in statistics to speak of the “population” from which a sample is drawn...The expression is a holdover from the time when statistics was biostatistics, and the object of study was the human population....In econometrics, the use of the term population is simply a metaphor. A better concept is that of a **data generating process**, or **DGP**. By this term, we mean whatever mechanism is at work in the real world of economic activity giving rise to the numbers in our samples, that is, precisely the mechanism that our econometric model is supposed to describe. A data generating process is thus the analog in econometrics of a population in biostatistics. Samples may be drawn from a DGP just as they may be drawn from a population. In both cases, the samples are assumed to be representative of the DGP or population from which they are drawn.
- Thus, even if one has “all” of the data on, say, Apple prices or US national income, the very fact that one runs a regression, with residuals, means that one has assumed a DGP with certain statistical properties.
- c) “Third, even if the transactions data were a sample, the sample size within each group of transactions for each type of iPod is large, as is the number of such groups. The magnitude of cluster effects diminishes with sample size, and these sample sizes are large enough to cause the effect of clustering to become unimportant.”²² Again, this

²⁰ See Noll rebuttal declaration at 46.

²¹ See, e.g., Angrist and Pischke, Ch. 8, Section 8.2.1 on “Clustering and the Moulton Factor”, at p. 231-236. Professor Noll has stated that his discussion of clustering is based, in part, on the chapter of Angrist and Pischke in which this section is contained. (See Noll rebuttal declaration, n. 14.) Although this is the section that is relevant to this point, there is nothing in there that suggests that the clustering issue only applies to samples and not to an entire population.

²² See Noll rebuttal declaration at 46.

is simply wrong. It is still necessary to correct the standard errors for correlation even when one has a large number of groups and a large number of observations within each group—the calculation of the standard errors corrects for sample size.²³

- d) “Fourth, variables to account for differences among these groups of transactions are present in the data set and are included in the regression.”²⁴ Again, this is wrong. Whatever variables Professor Noll *has* chosen to include in his new regressions -- and it is worth emphasizing that he chose to *omit* relevant and statistically significant characteristics that materially affect his results—the question is whether the residuals *of those new regressions* are correlated or not. They are, and highly so. That correlation must be accounted for, and Professor Noll refuses to do so.

Professor Noll’s arguments are just noise. As he concedes in his rebuttal report, the only relevant question is: Are the errors correlated within groups or not? This is relatively easy to answer – all one needs to do is examine the standard errors with and without clustering. If the standard errors change significantly once we account for clustering, it shows that the errors are correlated, and that they are correlated in a way that matters greatly for statistical inference and significance.²⁵

B. In His New Regressions, Professor Noll Used the Wrong But-for World

12. The “before and after” methodology used by Professor Noll requires a clear and meaningful definition of the “before” period, which is the but-for world that would exist in the absence of the challenged conduct. Professor Noll has changed the specification of his indicator

²³ Econometric literature clearly states that large number of clusters not only does not eliminate the need to cluster, but in fact makes clustering work better (because small number of clusters causes underestimation of clustered standard errors). See *Mostly Harmless Econometrics: An Empiricist’s Companion*, by Angrist and Pischke, at p. 319; Also see *A Practitioner’s Guide to Cluster-Robust Inference*, by Colin Cameron and Douglas L. Miller (Department of Economics, University of California - Davis), October 15, 2013, at p. 28.

²⁴ See Noll rebuttal declaration at 46. This statement is incorrect. As we show below, Professor Noll has omitted several important variables, and thus his new regressions suffer from omitted variable bias. Correcting this bias does not correct the problem of correlation among the error terms within groups, but Professor Noll refused to investigate whether his regressions suffered from such bias, let alone investigate whether correcting it would remove the need to cluster.

²⁵ Professor Noll’s own regressions as presented in his rebuttal declaration exhibits, show that there was correlation among the error terms in his original methodology. (See Exhibits 1-A to 3-B.) The tests above show that this correlation remains.

variables for iTunes 4.7 and iTunes 7.0. He now “turns on” the indicator variable for iTunes 7.0 and “turns off” the indicator variable for iTunes 4.7 for each of the affected models at the time at which the [REDACTED] feature of iTunes 7.0 was first included in a particular model.²⁶ At the same time, he includes an indicator variable (Harmony2) for the fact that Harmony began to once again interoperate with the iPod in April 2005 (about six months after the release of iTunes 4.7). He explained in his rebuttal declaration and at deposition that he turned off 4.7 when 7.0 was turned on because 7.0 replaced the previous software represented by 4.7. Thus, the but-for world is one in which iTunes 4.7 is not replaced by iTunes 7.0.

13. His treatment of the iTunes 4.7 indicator variable, however, presumes a different but-for world. By turning this variable off, his but-for world does not include 4.7. Instead he is comparing the actual world of iTunes 7 to the world that existed in the 3-month period from July to October of 2004, when iTunes 4.7 was released. This is roughly two years prior to the first introduction of the challenged technologies in this case, and it assumes that the legal technologies of iTunes 4.7 would not exist in the but-for-world. On top of this he has layered a new variable (Harmony2) for the entire period after April 2005, when Harmony could again interoperate with iTunes 4.7 technology. So his but-for-world is one in which iTunes 4.7 technologies do not exist, but a version of Harmony that interacts with it does. This makes no sense. Even with his new Harmony2 indicator, a proper specification of the but-for-world would leave on the indicator for the legal iTunes 4.7 technology. Putting aside other flaws in his model, this would allow the coefficient on iTunes 7 to represent the *incremental* effect of iTunes 7; that is, the but-for world would be the world that *existed* before the release of iTunes 7.0. As he has done it, and as explained in our earlier reports, Professor Noll attributes the *legal* impact of DRM technologies in iTunes 4.7 to iTunes 7.0 -- a form of omitted variable bias.

14. To correct Professor Noll’s error, we have rerun his regressions allowing for the continued existence of the DRM technologies in iTunes 4.7. The effects of this correction are shown in Column 4 of Exhibits JT-1a and JT-1b. Putting aside the other flaws in his model, in both cases this correction causes the reported effect of the iTunes_7 variable to decrease – in the

²⁶ See Noll rebuttal declaration at 6.

case of the reseller regression, the change is small, but in the case of the direct sales regression, it is more than 50 percent.

15. In addition, his treatment of the indicator variable for iTunes 7.0 is at odds both with the facts and with his own stated view. As explained in the Topel report, under plaintiffs theory, one would expect iTunes 7.0 to impact the demand for iPods that did not have [REDACTED] because, among other things, people with non-iPods and large libraries of music from the RMS who wanted an iPod may have been “locked out” of the [REDACTED] by iTunes 7.0, but they could still buy a [REDACTED] [REDACTED]. If this truly was an issue, one would expect the prices of other iPods to be impacted. In his recent deposition, Noll agreed that this was a possibility.²⁸

C. Although Professor Noll Changed the Specification of his Model, he Failed to Include a Number of Characteristics in his New Regressions that are Important in Explaining the Price of iPods

16. In his new regressions, Professor Noll adds a variable for the relaunch of Harmony, changes his treatment of time from logarithmic to scalar, and moves the date on which the iTS became DRM-free, but omits other significant variables, including variables to account for attributes of iTunes 7.0 and the iTS and for a number of iPod characteristics or attributes that one would expect to impact the price of iPods. He claims that his new regression with the new specifications include all the variables he needs and that adding any additional characteristics would cause “extreme multicollinearity.”²⁹ However, Professor Noll has done nothing to investigate either claim. Had he done so, he would have found that he is wrong on both counts.

1. The Omitted iPod Characteristics are Important in Explaining the Variance in iPod Prices

17. One way to determine whether a variable or group of variables is important in explaining the variance in the dependent variable is to examine the statistical significance of those variables. When the characteristics that we identified, but that Professor Noll ignored, are added to his preferred regressions, we find that, in the Reseller regression, all but one of them are

²⁷ See Topel report at ¶¶117-122.

²⁸ See Noll Deposition, December 18, 2013, at 51:16-52:5; 55:22-57:9; 65:5-21.

²⁹ Noll rebuttal declaration at 8.

individually statistically significant, and in the Direct Sales regression all but two of them are individually statistically significant.³⁰ (See Exhibits JT-5a and JT-5b.) They are also jointly significant -- that is, they have statistically significant explanatory power when considered as a group. (See Exhibits JT-5a and JT-5b.³¹) In fact, as Exhibits JT-5a and JT-5b show, they are jointly more significant than the indicator variables Professor Noll uses in his analysis and in the Direct Sales regression, they are more significant than his own characteristics, excluding memory capacity.³²

18. Professor Noll may, as he has in the past, contend that adding characteristics to his regressions is unnecessary if it increases the R-squared by a “small” amount.³³ This is irrelevant because it says nothing about the statistical significance of that increase—in statistics, “small” is determined by the data. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]³⁵ [REDACTED]

³⁰ For a list of these variables, see Topel report at n. 56, and Exhibit 10 (List of additional characteristics). The exceptions are `log_music_battery_hours` which is insignificant in both with a t-statistic of 1.358 in the Reseller regression and 0.903 in the Direct Sales regression and `log_display_inches`, which is significant in the Reseller regression and insignificant in the Direct Sales regression with a t-statistic of 1.656.

³¹ These exhibits report the joint significance of these variables after clustering by family and quarter. Obviously, the apparent significance is much greater with unclustered standard errors, but the pattern remains the same. (See Appendix D.)

³² [REDACTED]

³³ “When Professor Topel adds more variables that measure technical characteristics to the regression equation, R-squared increases by .0063 in the reseller equation and by .00053 in the direct sales regression.” Noll rebuttal declaration, Note 8 at 30.

³⁴ R-squared is an indication of the fraction of variation in the dependent variable that is explained by the variables included in the regression equation. As such, it can never be more than 1.0000, i.e., the included variables can never explain more than 100 percent of the variation in the dependent variable.

³⁵ The number is actually 47 percent. The corresponding numbers for the direct sales regression are as follows: the R2 in Professor Noll’s regression is .9816. With the additional characteristics, the R2 is .9886. The difference is .0050 out of .0184, or 27 percent.

2. Adding our Characteristics to Professor Noll's Regressions does not Result in "Extreme Multicollinearity"

19. Professor Noll also claims that he did not add characteristics other than Harmony2 and making an adjustment to the date on which the iTunes became DRM-free because adding other characteristics would cause "extreme multicollinearity."³⁷ "Multicollinearity" refers to a situation in which a variable, or set of variables, is highly correlated with other variables in the model. The problem this creates is one of *precision* in estimating the model's coefficients. As a well-known econometrics textbook puts it: "the data simply do not contain enough information to allow us to obtain precise estimates of all of the coefficients."³⁸ Multicollinearity is related to the problem of "omitted variables bias" in which the variable that is included in the regression (say, iTunes 7) "picks up" the true effects of omitted variables (say enhanced video) with which it is correlated.

20. Professor Noll did not examine whether adding characteristics would cause a multicollinearity problem. Had he done so, he would have found none. The characteristics that he omitted from his new regressions are statistically significant predictors of prices. These independent effects can be estimated because, to paraphrase the econometrics text cited above, "the data [do] contain enough information to allow us to obtain precise estimates of all of the coefficients." By not including these characteristics in his regressions, the regressions are *using* omitted variables bias to "find" effects that are not there.

21. A final point on collinearity. One way to determine whether a variable is affected by collinearity with other variables is to calculate the change in its estimated standard error when

³⁶ And, we note that, in both cases, omitting the variable iTunes_7 has a smaller effect on the R2 than does omitting these additional characteristics. In fact, it has no detectable effect in the reseller sales regression, and it has a negative effect in the direct sales regression where the reported Adj. R-squared actually falls from 0.9816 to 0.9815. Thus, if Professor Noll's logic was correct, the variable for iTunes_7 does not add to the explanatory power of the regression and thus, presumably should not have been included in the regression.

³⁷ See Noll rebuttal declaration at 8.

³⁸ See *Econometric Theory and Methods* (2004), by Russell Davidson and James MacKinnon, p103-104.

the other variables are added to the regression.³⁹ If collinearity is an issue, inclusion of the additional variables will cause the estimated standard error to increase substantially. Adding the product characteristics mentioned above does *not* substantially increase the estimated standard error on the iTunes 7 coefficient. In fact, in the reseller regression, inclusion of these statistically significant predictors actually reduces the standard error on the iTunes 7 coefficient. (See Exhibits JT-6a and JT-6b, which present the Noll regression results reporting standard errors instead of t-statistics.)⁴⁰

3. Professor Noll's New Regressions Suffer from Omitted Variable Bias

22. As noted above, the danger in omitting variables (Z) that affect the outcome of interest (here, iPod prices) is that included variables (X) correlated with Z will “pick up” the effects of the omitted variables. The estimated coefficients on variables X will be biased. This is called “omitted variable bias.”⁴¹ Then adding the previously omitted variables to the regression will cause the coefficients on X to change by a material amount. This is exactly what happens with the coefficient on the iTunes_7 indicator variable. In both the reseller regression and the direct sales regressions, when the proper but-for world is taken into account, the iTunes coefficient falls dramatically when the incorrectly omitted variables are added to Professor Noll's regressions.

II. PROFESSOR NOLL'S REBUTTAL REPORT INTRODUCES A NEW THEORY OF IMMEDIATE IMPACT

23. Professor Noll argues for the first time in his rebuttal declaration that iTunes 7.0 would have immediately affected iPod prices because of its lock-out effect on owners of RMS music. This is at odds with what he said before about the impact of lock-in. Until now,

³⁹ See A Course in Econometrics, by Goldberger (1991), Chapter-Multicollinearity 23, at 245, 251-252.

⁴⁰ Although it is not reported in these exhibits, we have included the full regression results in Appendix D3. These results show that the standard error on the dummy variable for the Shuffle goes up dramatically, a clear indication that at least one of the newly included variables is collinear with the Shuffle. However, since the magnitude of the coefficient on Shuffle variable is of no practical interest in this context, this collinearity is irrelevant.

⁴¹ Professor Noll himself is well aware that his regressions may suffer from omitted variable bias. “[I]f this is a systematic problem over the entire data set, it would say that you need some more variables, which I readily conclude, you need more variables. This isn't a regression that I would use to calculate damages because I don't have enough information in it or enough variables in it.” (See Noll Deposition, April 7, 2011 at 120:22-121:2); See Also Expert Report of Dr. Michelle M. Burtis, filed April 11, 2011 (“April 2011 Burtis Report”) at ¶7.

Professor Noll's principal claim was that iTunes 7.0 increased lock-in, which ultimately increased demand and prices for iPods. He claimed that impact from lock-in would not have been immediate, but would have occurred over time. He repeats the point in his rebuttal declaration on pages 7 and 27, noting that the impact would not occur until customers purchased replacement players which would be some time after the introduction of iTunes 7.0.

24. In his rebuttal declaration, Professor Noll argues for the first time that iTunes 7.0 would have had an immediate impact on iPod price because of its lock-out effect on owners of non-iPods that play RMS music. However, he presents no evidence that either the facts of this case or the conditions in the marketplace support his new theory. First, Professor Noll's lock-in theory requires that, in the absence of iTunes 7.0, a substantial fraction of iPod owners would have purchased their music from the RMS, but because Apple released iTunes 7.0, those owners were "forced" to purchase their music from the iTS instead. As we showed in our earlier reports, RealNetworks' Harmony was such a small presence in the marketplace that it could not have had this impact that Professor Noll hypothesizes.⁴² Professor Noll's lock-out theory, on the other hand, requires that there be a relatively large population of owners of digital media players who have large quantities RMS music that Apple deliberately locks out with [REDACTED]⁴³ But just as its small presence in the marketplace renders Harmony ineffective in locking iPod owners in, so too does it render Harmony ineffective in affecting the price of iPods by locking owners of other MP3 players out of the iPod market. The RMS just was not very important, regardless of which theory Professor Noll uses.

25. Notwithstanding Professor Noll's claims in his rebuttal report that iTunes 7.0 caused Apple to increase prices of iPods and his statement at deposition that he expected that iTunes 7.0 had *no* impact on prices of non-iPods, Apple continued to compete successfully with manufacturers of non-iPod digital music players. [REDACTED]

[REDACTED]

[REDACTED]

⁴² See Murphy report at ¶¶13a, 65, 66 and n. 115 and Exhibits 15a and 15b.

⁴³ Noll rebuttal declaration at 7.

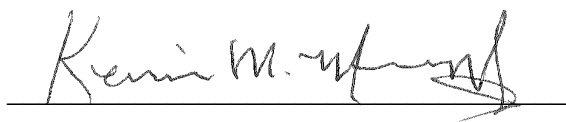
[REDACTED]

[REDACTED].⁴⁵ This shows that Apple had, and continued to have, an incentive to compete with non-iPod manufacturers on price. Had Apple raised its prices while non-iPod manufacturers maintained their current prices as Professor Noll claims they would, Apple would have lost not only customers who were allegedly locked out because of their RMS purchases, but also customers who were not locked out including those who were new to digital music players. In light of these facts, it is implausible to think that Apple would find it in its interests to raise the price of iPods at the time it released iTunes 7.0.

26. To the extent that Professor Noll claims that Apple increased the price of the [REDACTED] anticipation of [REDACTED] impact on demand, it is complete speculation. There is no evidence that shows (and Professor Noll testified that he was unaware of any) that, when Apple determined the price for the iPod [REDACTED], it examined the impact that the [REDACTED] would have on the elasticity of demand for iPod purchasers or for non-iPod purchasers with RMS libraries or on how many people would be locked out. In fact, there is no evidence that Apple took [REDACTED] into account at all when determining the price.

⁴⁴ [REDACTED]

⁴⁵ These numbers assume, conservatively (and contrary to economic fact), that Apple was not competing with other manufacturers for sales to buyers who were either replacing an existing iPod or adding to an existing stock of MP3 players, both iPod and non-iPod.

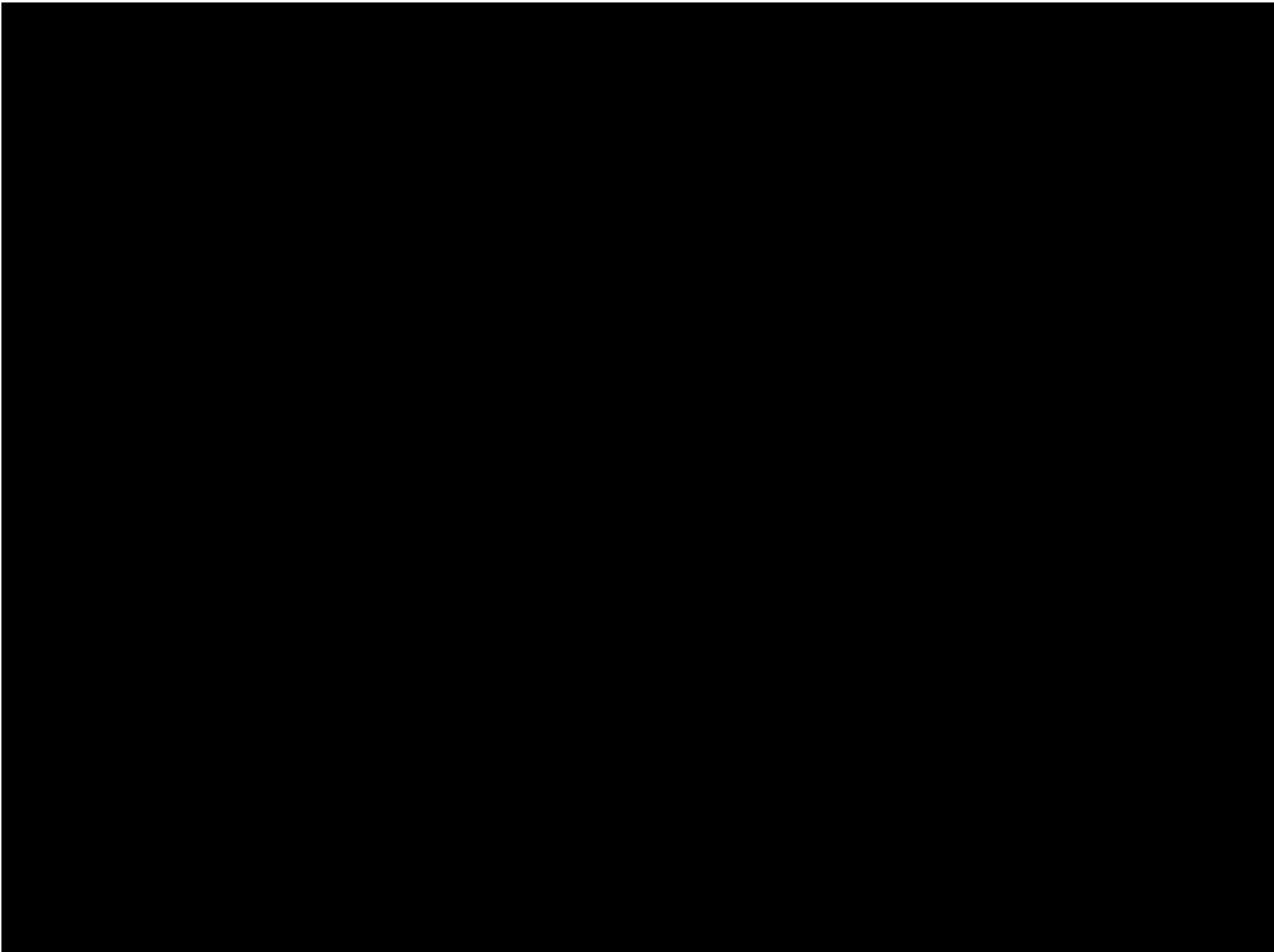
Handwritten signature of Kevin M. Murphy in black ink, written over a horizontal line.

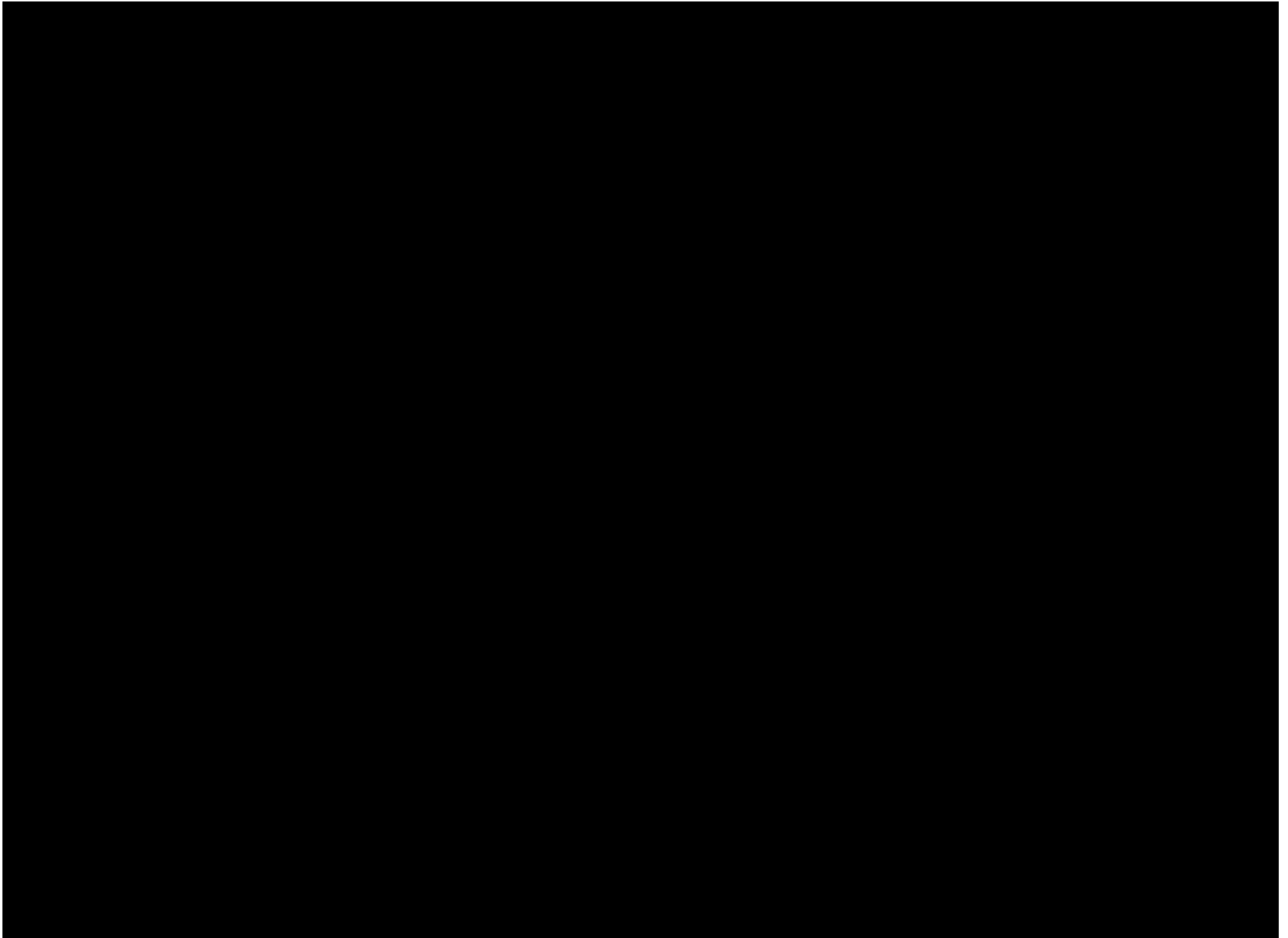
Kevin M. Murphy

Handwritten signature of Robert H. Topel in black ink, written over a horizontal line.

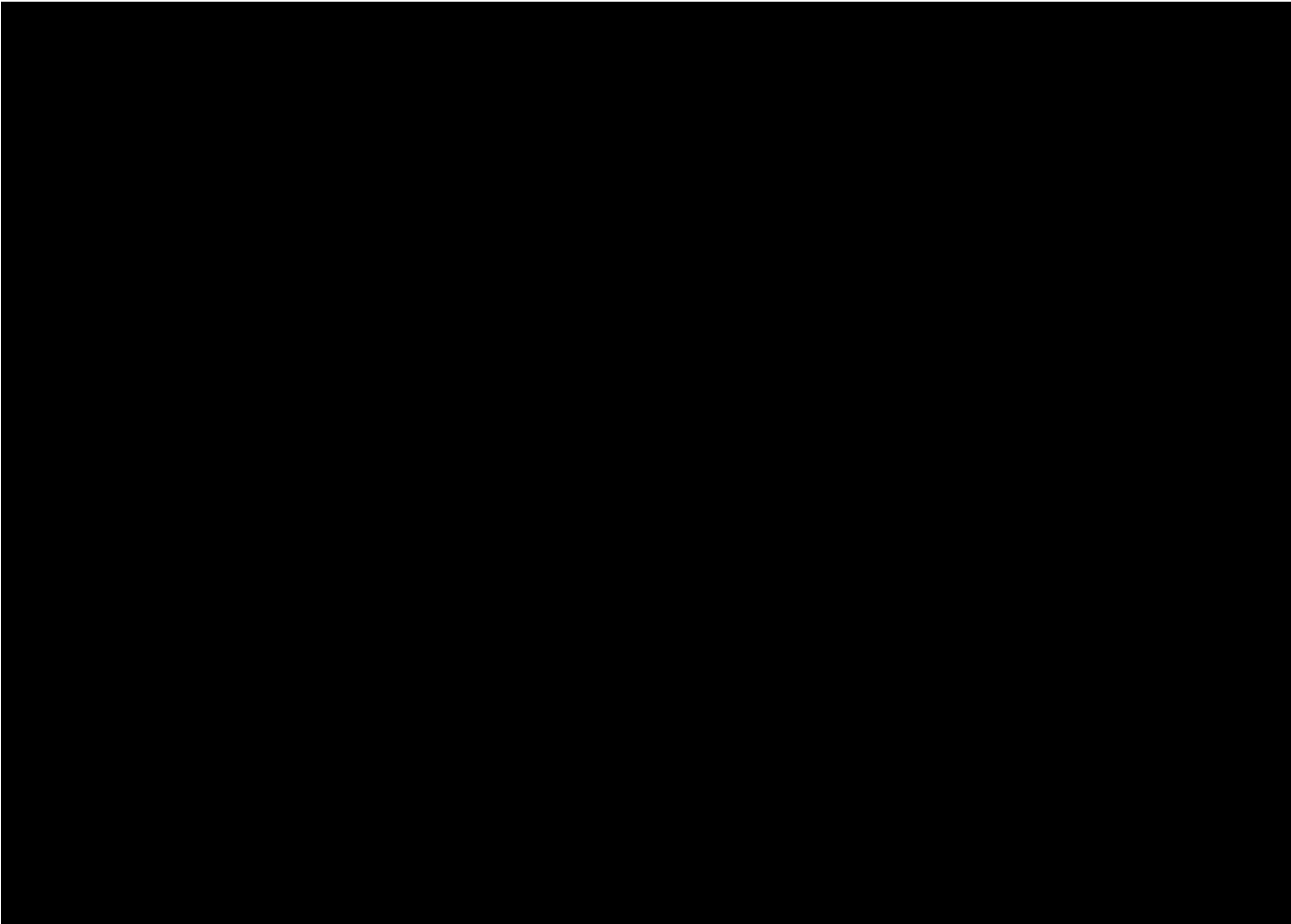
Robert H. Topel

December 20, 2013

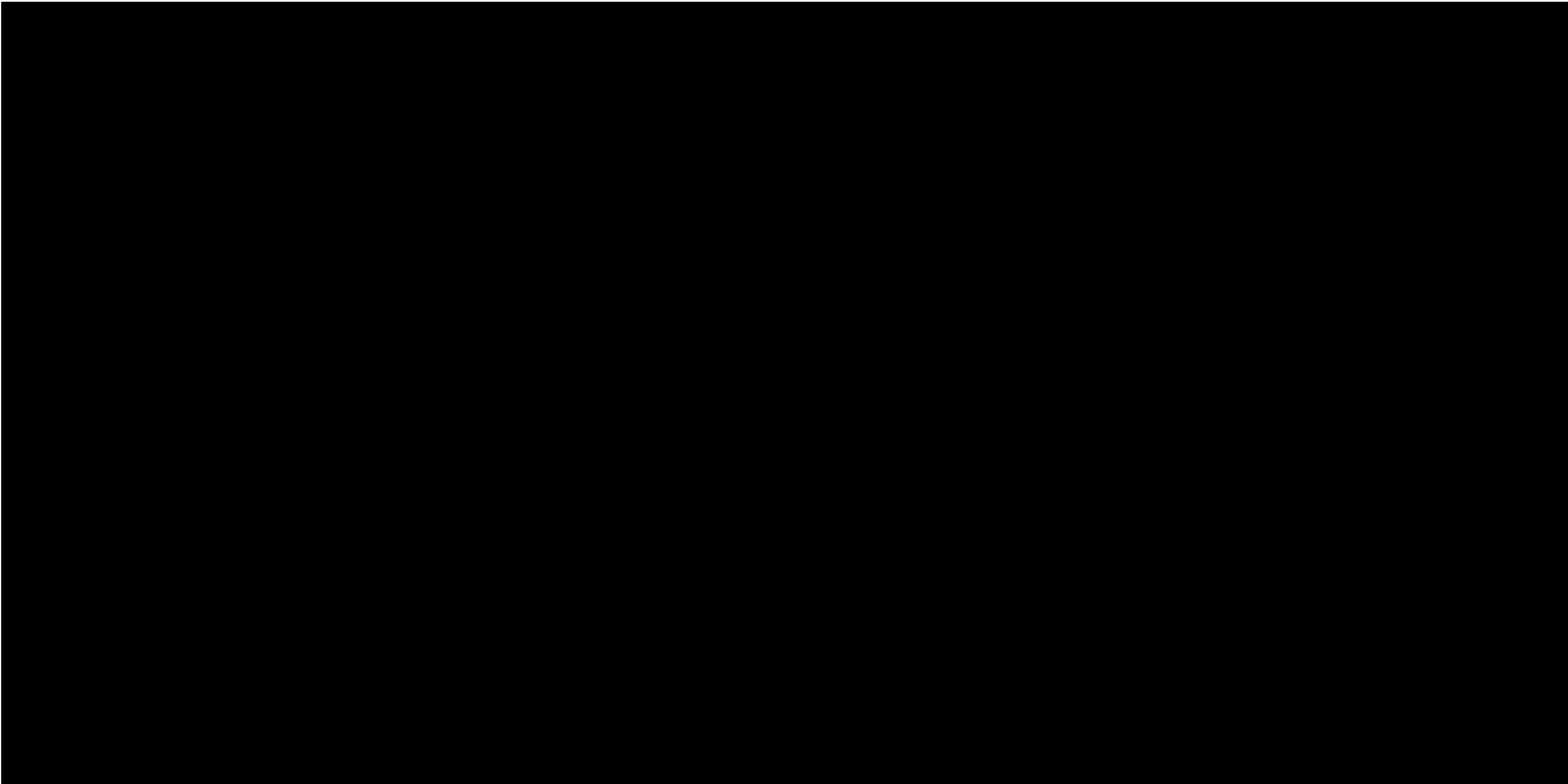




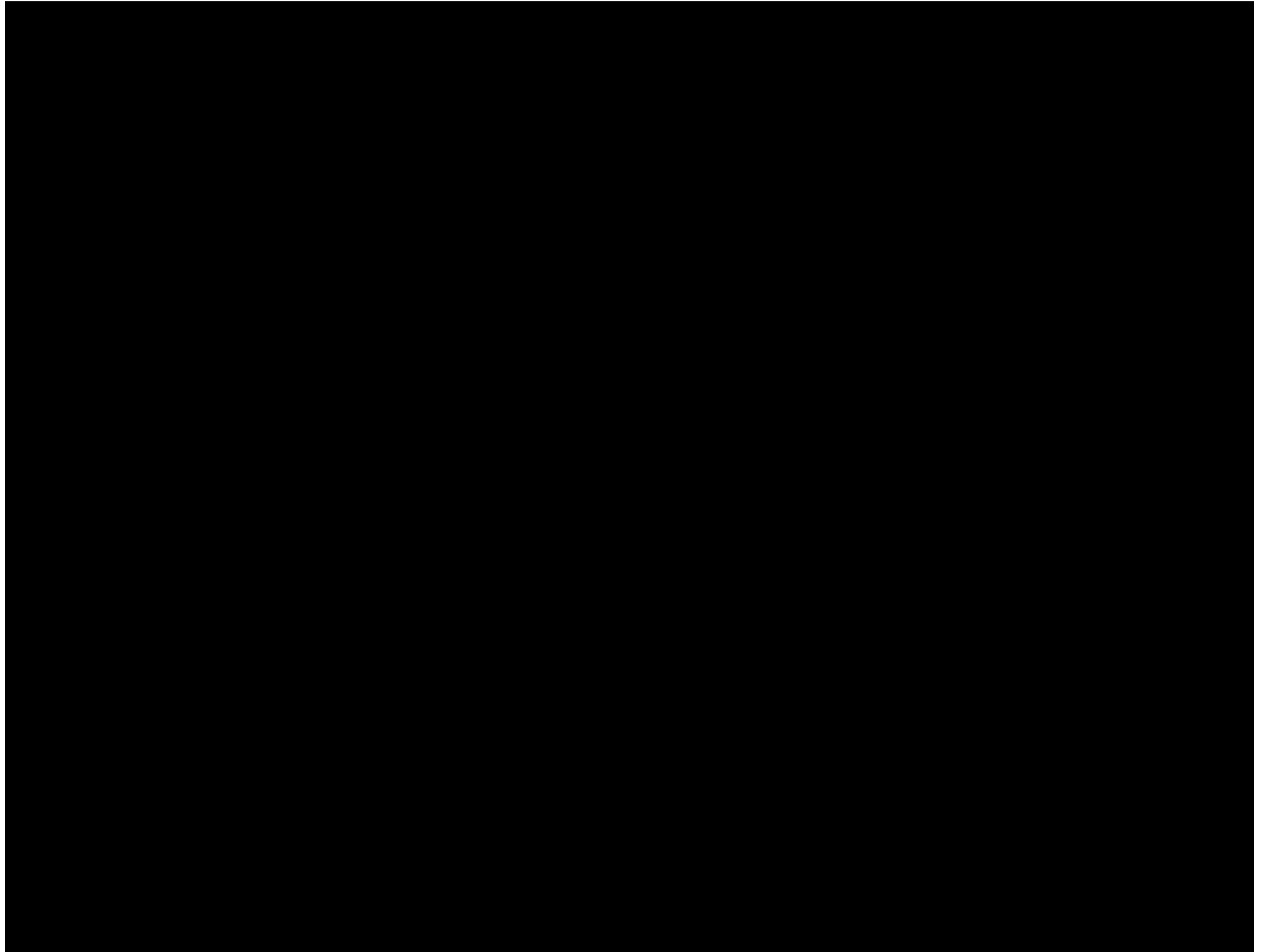
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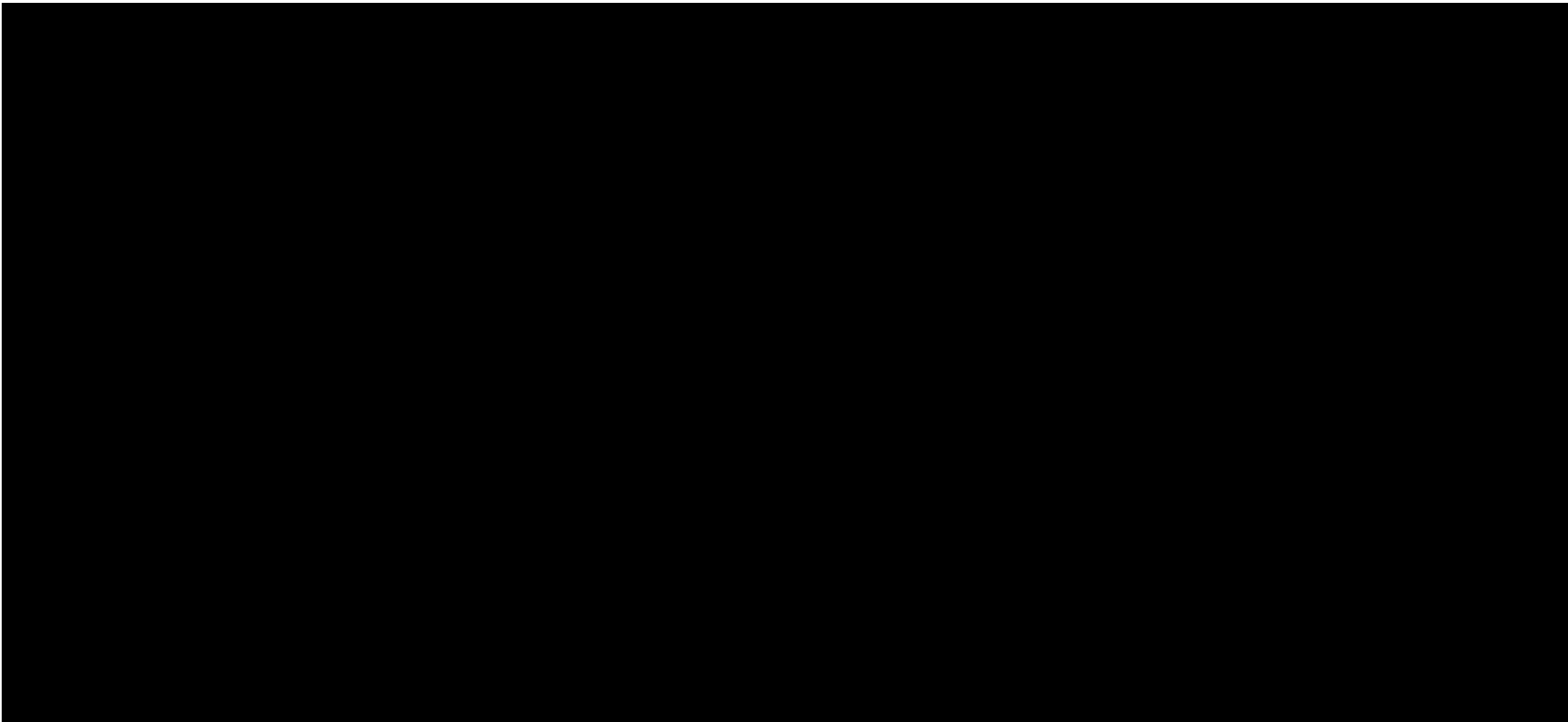


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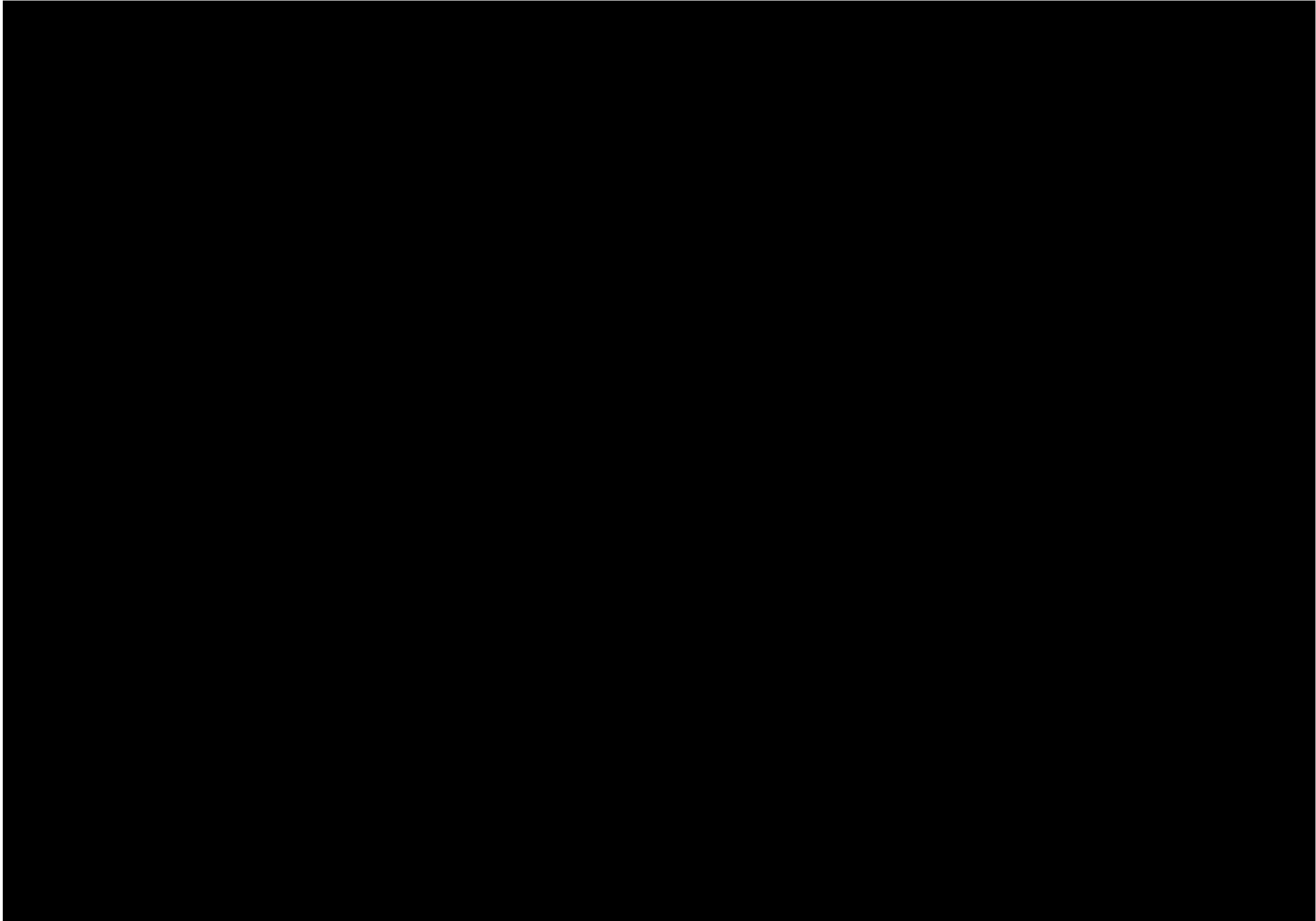
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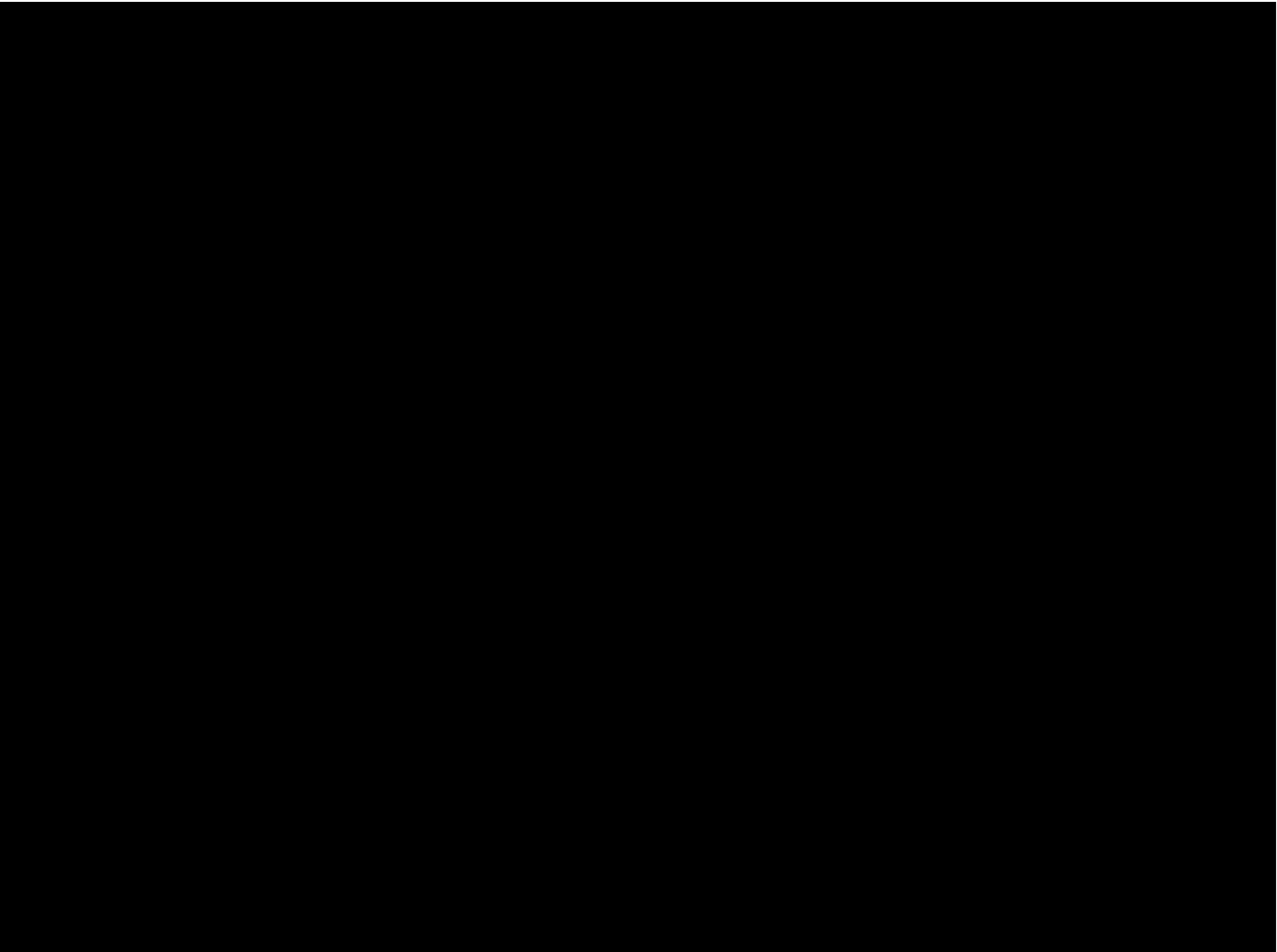




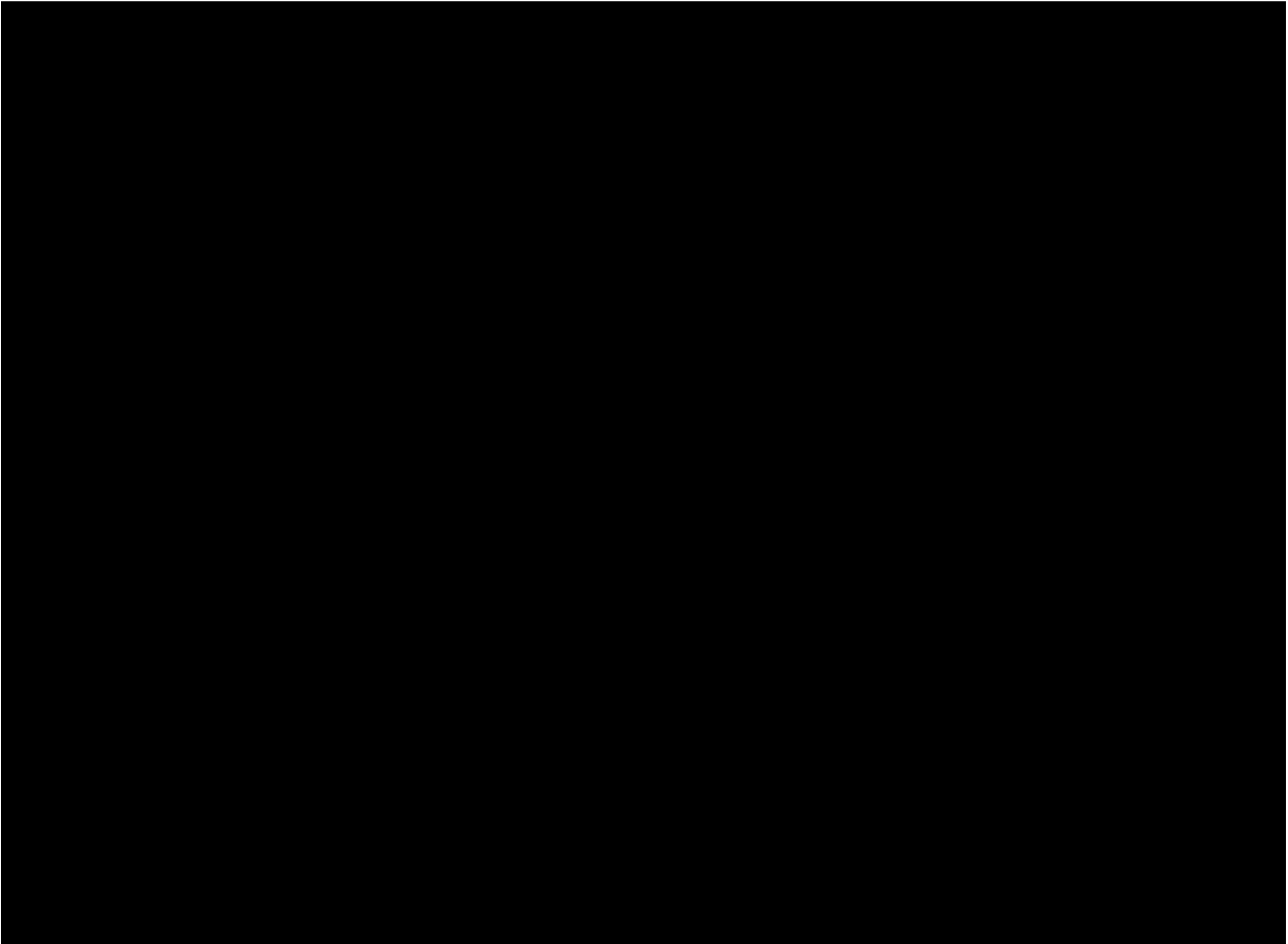
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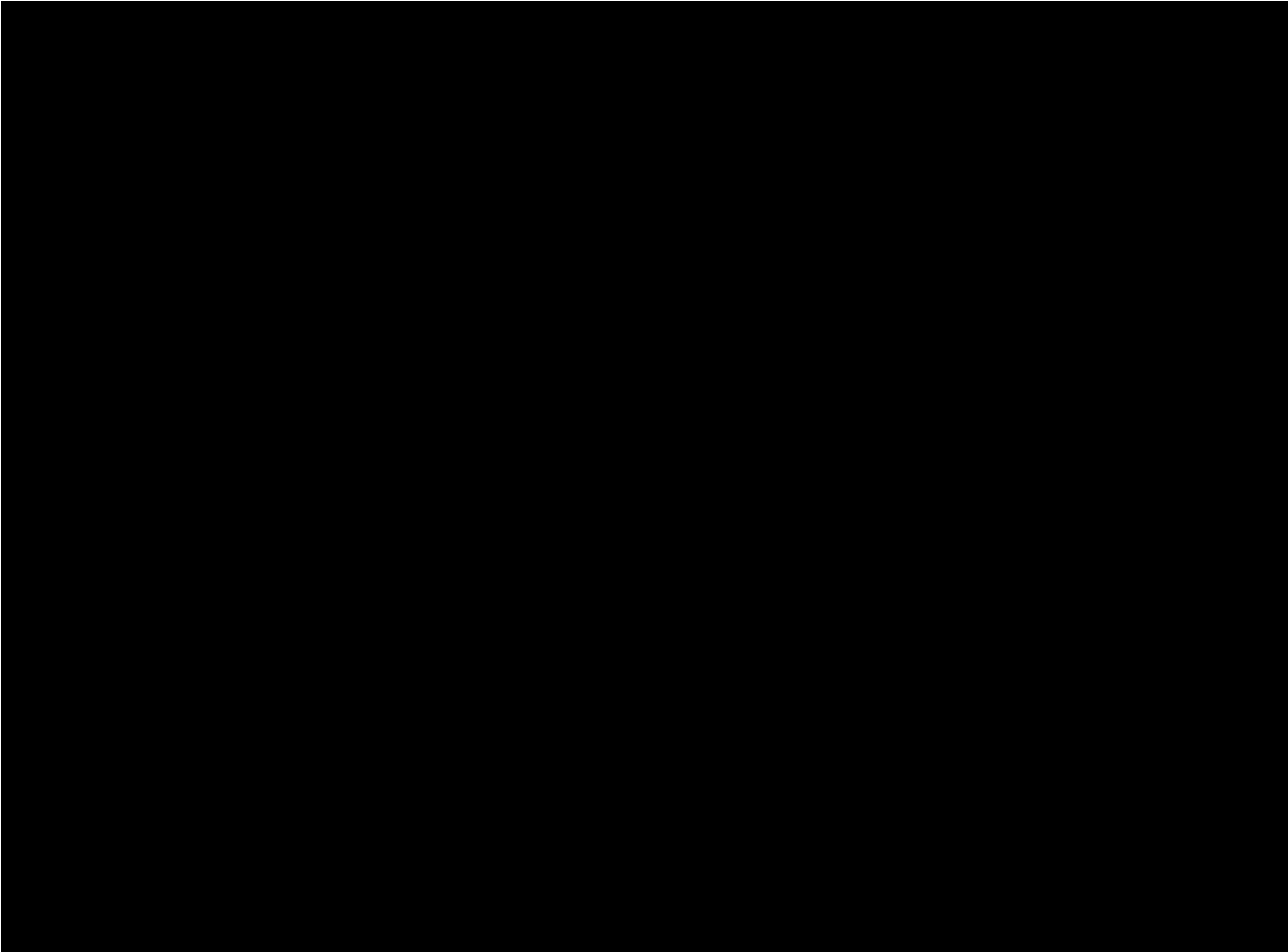
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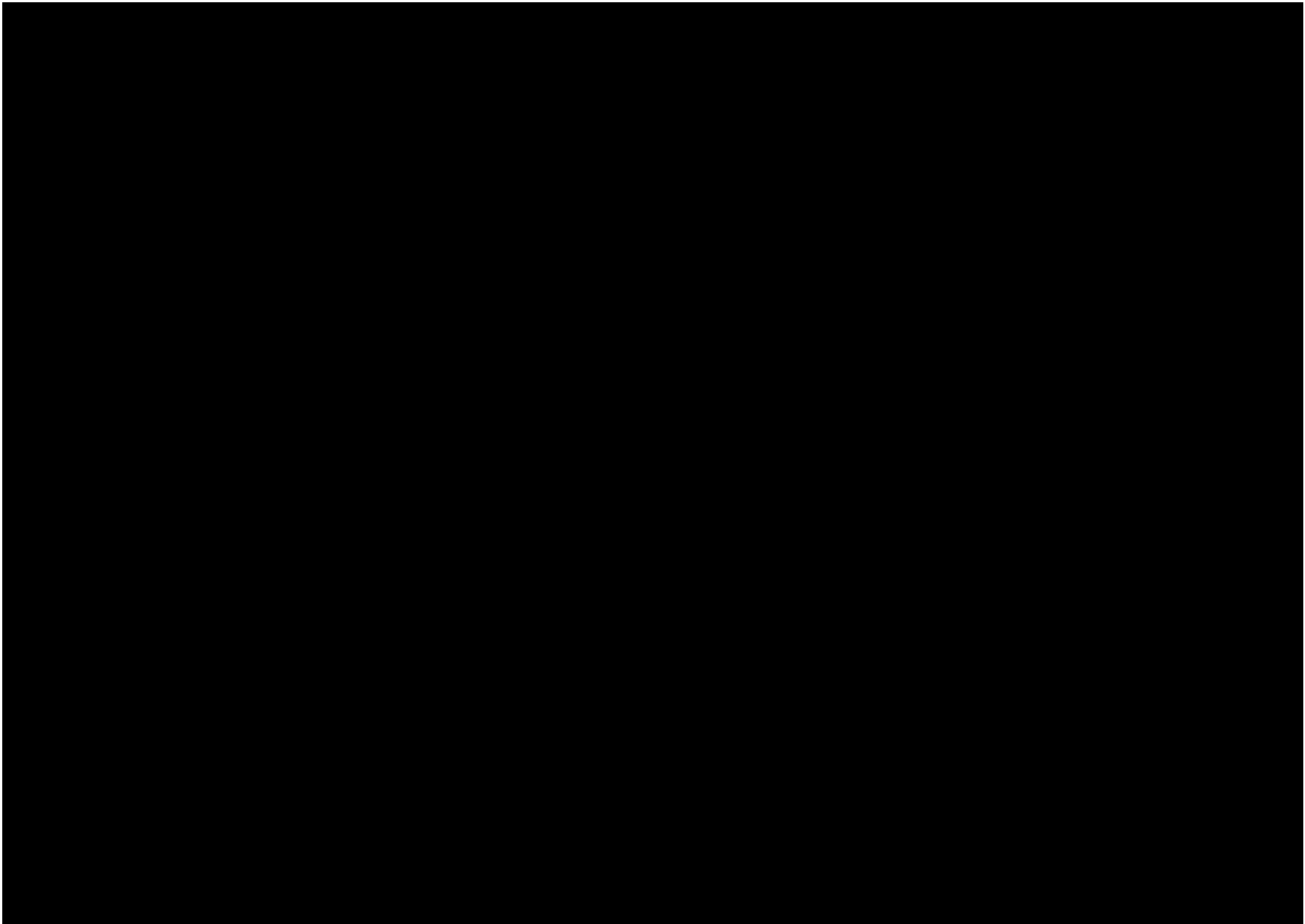
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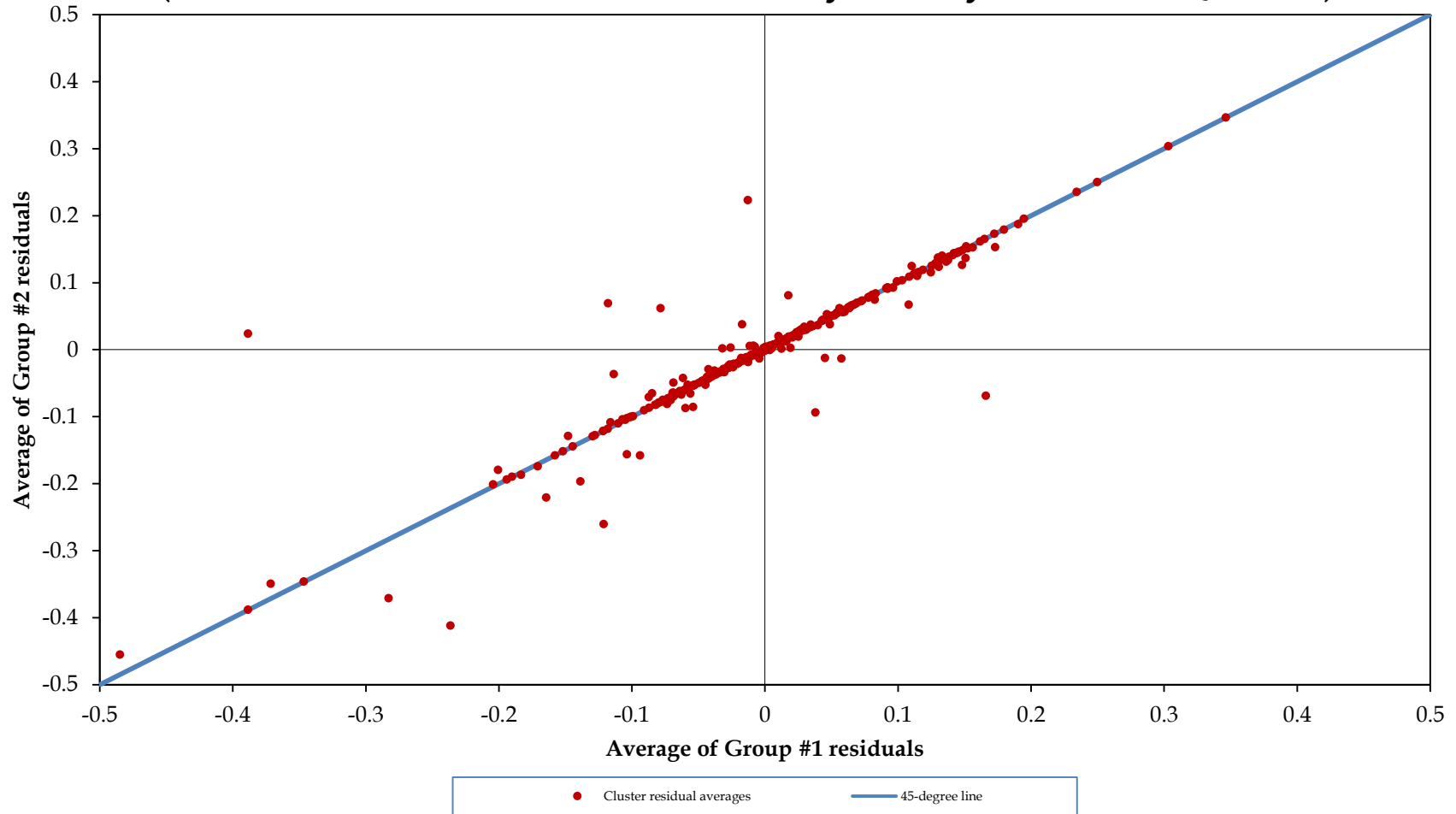


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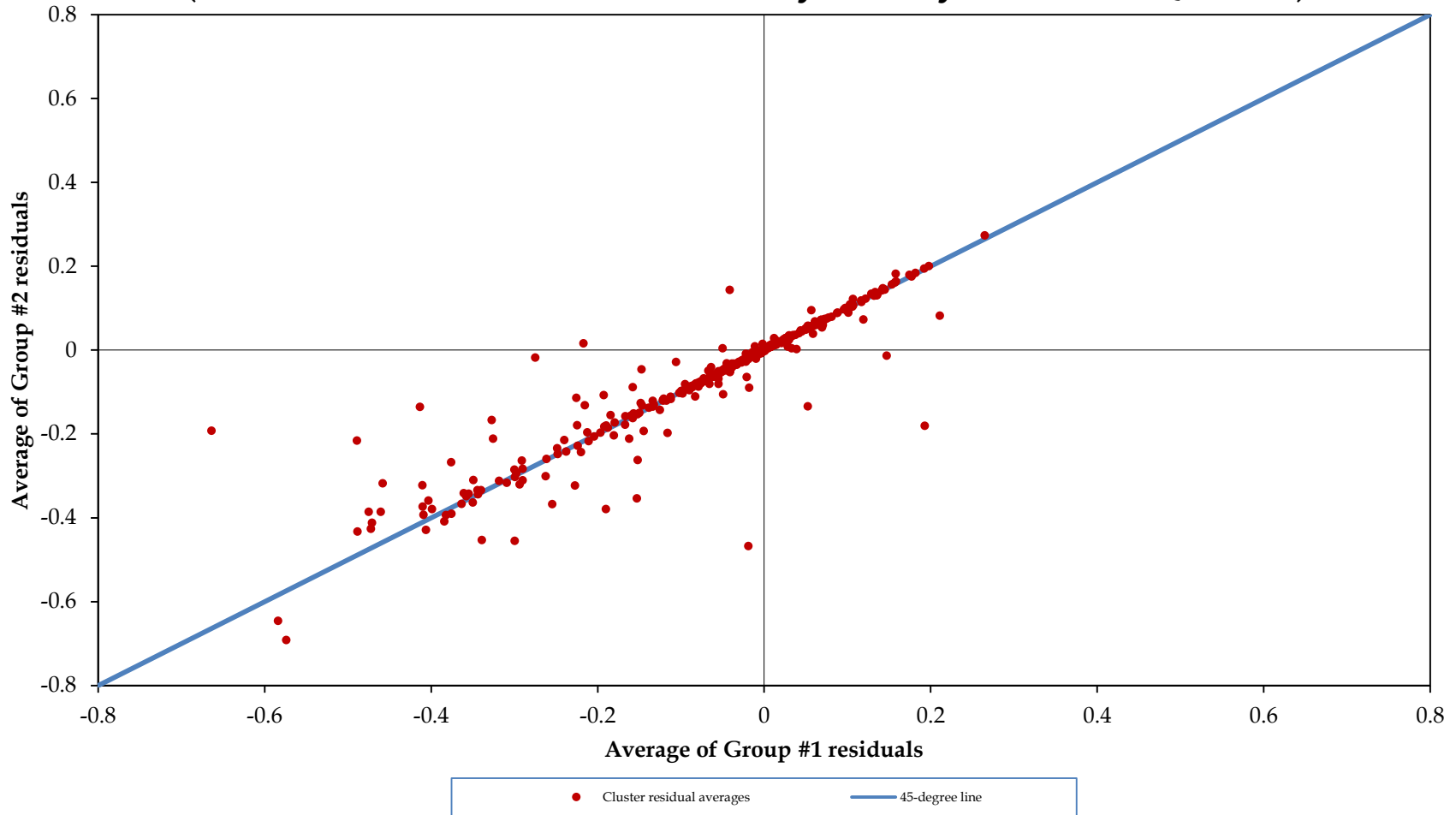
Exhibit JT-4a
Average of Regression Residuals
Divided Randomly in Two Groups, by Cluster
(Resellers Sales, Clusters Defined by Family and Year-Quarter)



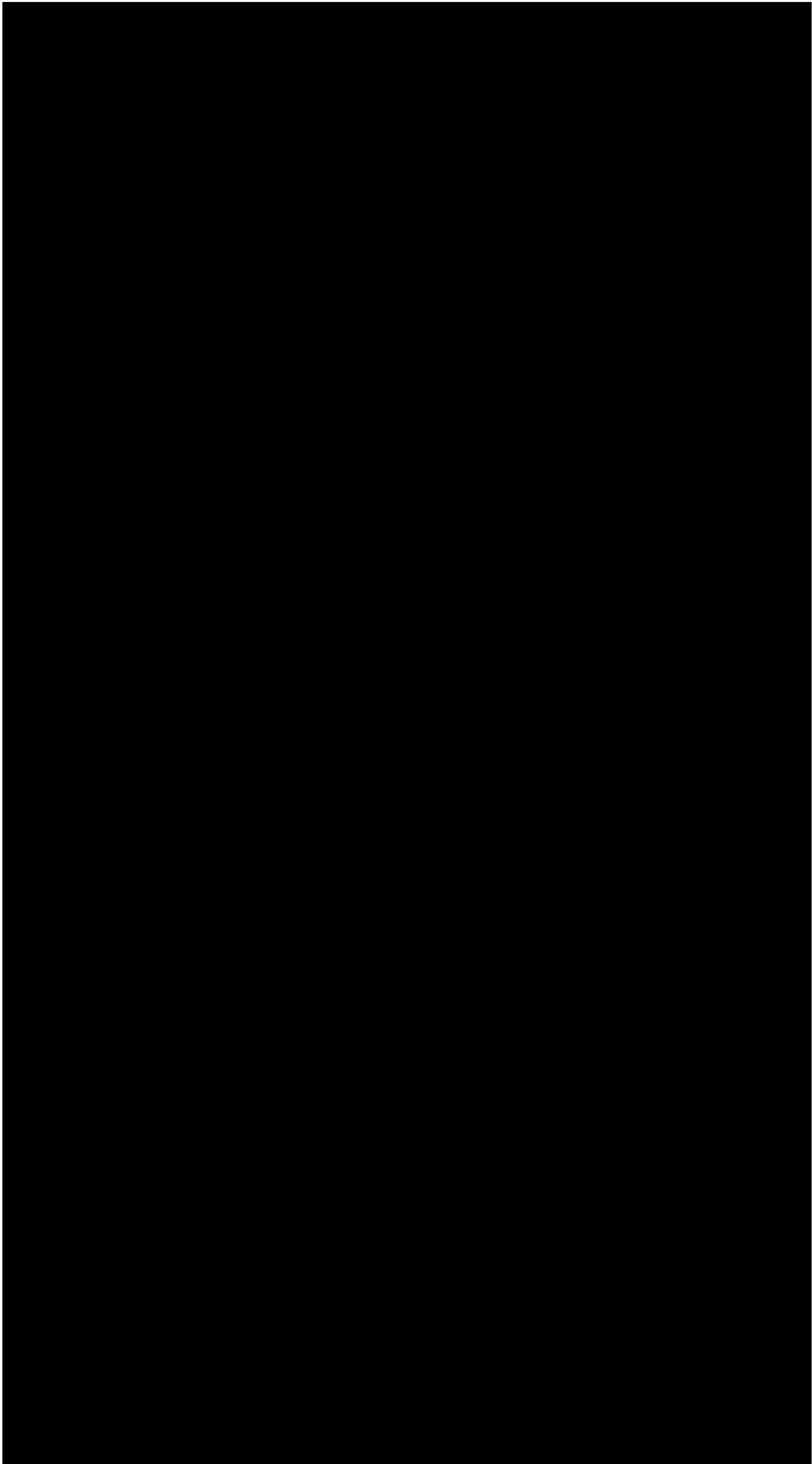
Sources: Apple iPod Sales Data

Exhibit JT-4b

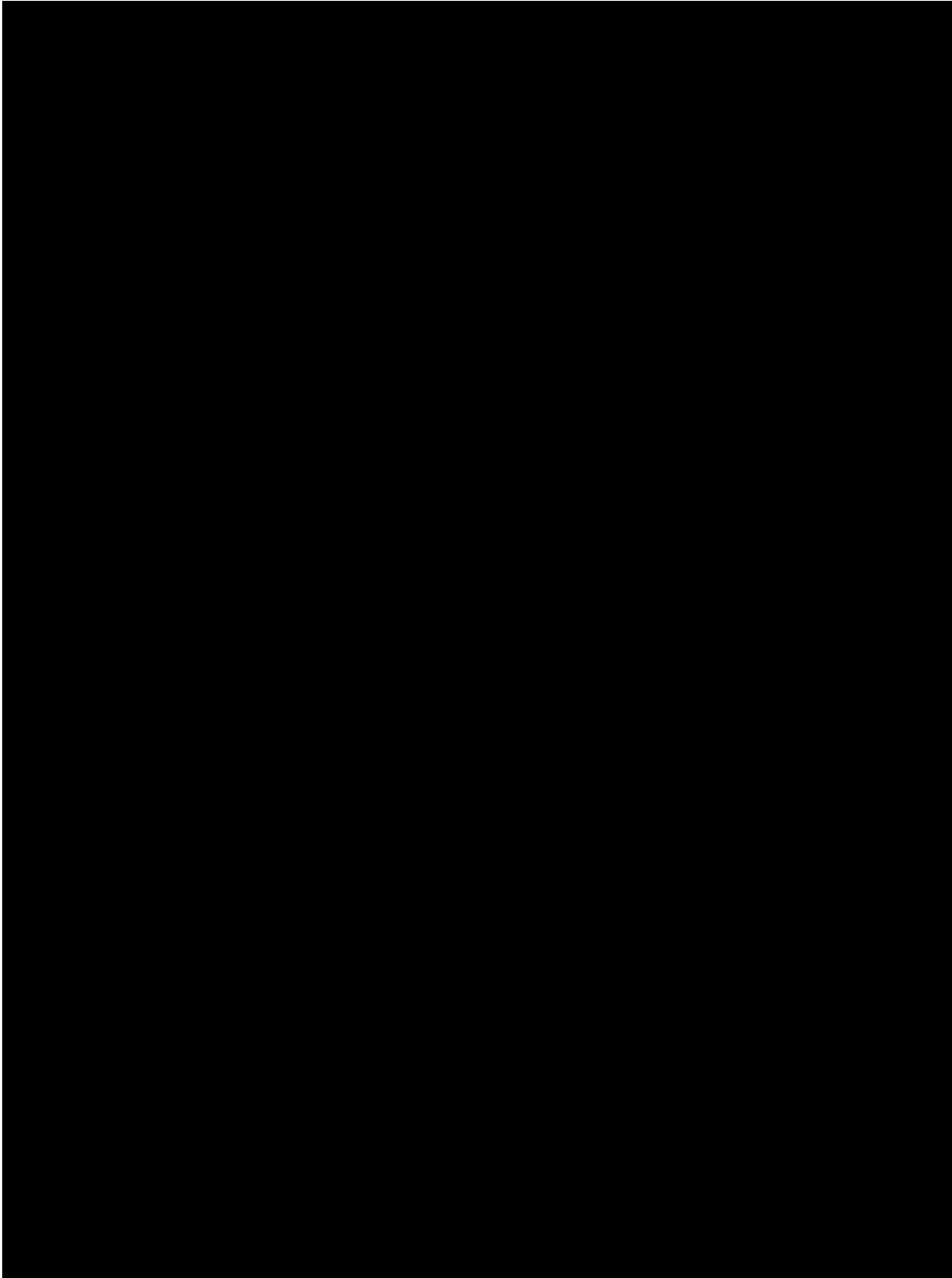
Average of Regression Residuals Divided Randomly in Two Groups, by Cluster (Direct Sales, Clusters Defined by Family and Year-Quarter)

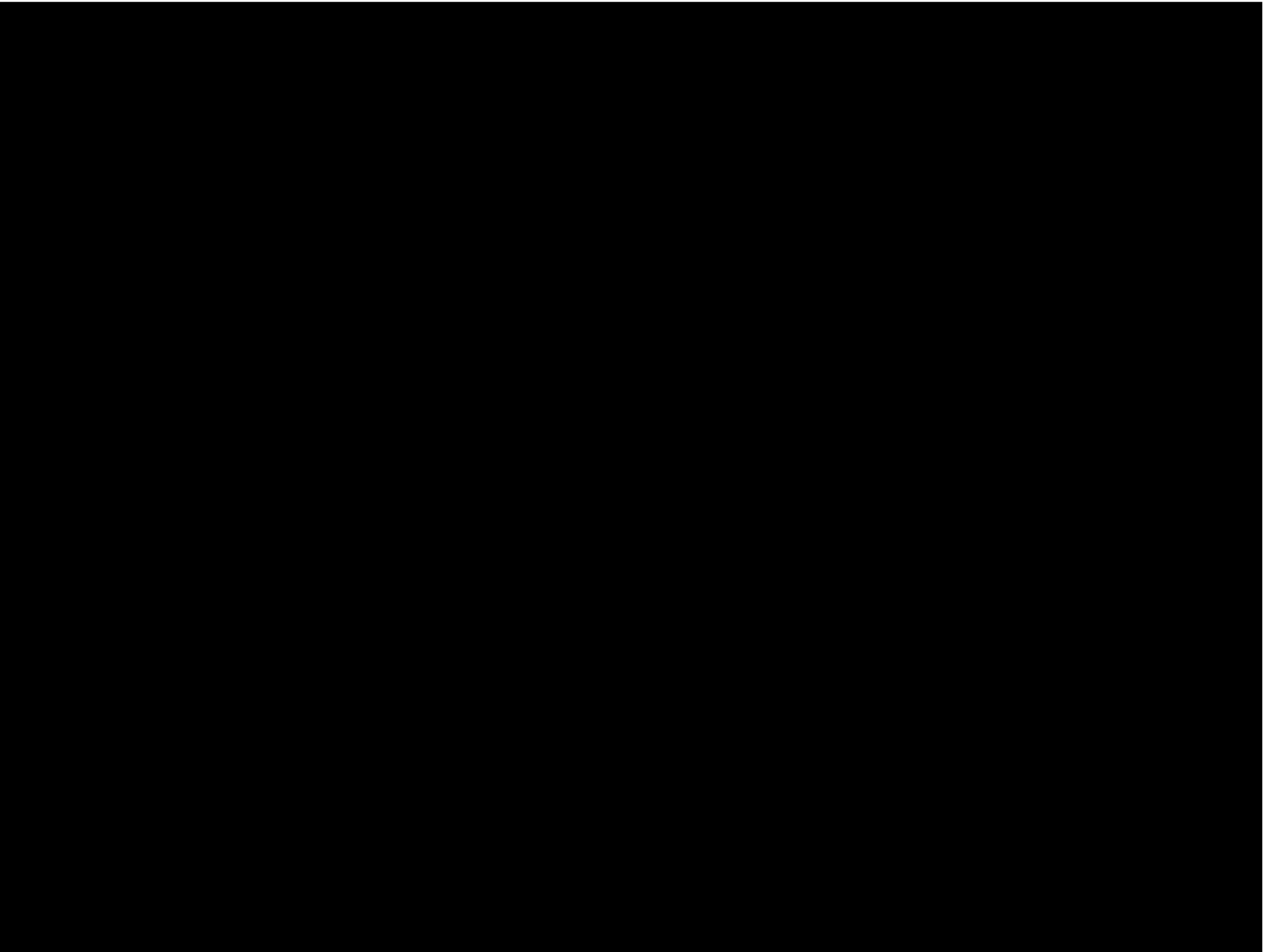


Sources: Apple iPod Sales Data



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Appendix A

Curriculum Vitae

Kevin M. Murphy

December 2013

Business Address:

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New Lenox, Illinois 60451
Phone: (815)463-4756
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Current Positions

July 2005-Present: George J. Stigler Distinguished Service Professor of Economics,
Department of Economics and Booth School of Business, University of Chicago

Faculty Research Associate, National Bureau of Economic Research

Education

University of California, Los Angeles, A.B., Economics, 1981

University of Chicago, Ph.D., 1986

Thesis Topic: *Specialization and Human Capital*

Previous Research and Academic Positions

2002-2005: George J. Stigler Professor of Economics, Department of Economics and
Booth School of Business, University of Chicago

1993 – 2002: George Pratt Shultz Professor of Business Economics and Industrial
Relations, University of Chicago

1989 – 1993: Professor of Business Economics and Industrial Relations, University of
Chicago

1988 – 1989: Associate Professor of Business Economics and Industrial Relations,
University of Chicago

1986 – 1988: Assistant Professor of Business Economics and Industrial Relations,
University of Chicago

1983 – 1986: Lecturer, Booth School of Business, University of Chicago

1982 – 1983: Teaching Associate, Department of Economics, University of Chicago

1979 – 1981: Research Assistant, Unicon Research Corporation, Santa Monica, California

Honors and Awards

2008: John von Neumann Lecture Award, Rajk College, Corvinus University, Budapest

2007: Kenneth J. Arrow Award (with Robert H. Topel)

October 2005: Garfield Research Prize (with Robert H. Topel)

September 2005: MacArthur Foundation Fellow

1998: Elected to the American Academy of Arts & Sciences

1997: John Bates Clark Medalist

1993: Fellow of The Econometric Society

1989 – 1991: Sloan Foundation Fellowship, University of Chicago

1983 – 1984: Earhart Foundation Fellowship, University of Chicago

1981 – 1983: Fellowship, Friedman Fund, University of Chicago

1980 – 1981: Phi Beta Kappa, University of California, Los Angeles

1980 – 1981: Earhart Foundation Fellowship, University of California, Los Angeles

1979 – 1981: Department Scholar, Department of Economics, University of California,
Los Angeles

Publications

Books

Social Economics: Market Behavior in a Social Environment with Gary S. Becker,
Cambridge, MA: Harvard University Press (2000).

Measuring the Gains from Medical Research: An Economic Approach edited volume
with Robert H. Topel, Chicago: University of Chicago Press (2003).

Articles

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- “Accounting for the Slowdown in Black-White Wage Convergence,” with Chinhui Juhn and Brooks Pierce, in Workers and Their Wages: Changing Patterns in the United States, pp. 107-143, ed. Marvin Kosters. Washington, D.C.: American Enterprise Institute (1991).
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- “Rational Addiction and the Effect of Price on Consumption,” with Gary S. Becker and Michael Grossman, 81 *American Economic Review* 237 (1991).
- “Wages of College Graduates,” in The Economics of American Higher Education, pp. 121-40, ed. William E. Becker and Darrell R. Lewis. Boston: Kluwer Academic Publishers (1992).
- “Changes in Relative Wages, 1963-1987: Supply and Demand Factors,” with Lawrence F. Katz, 107 *Quarterly Journal of Economics* 35 (1992).
- “The Structure of Wages,” with Finis Welch. 107 *Quarterly Journal of Economics* 285 (1992).
- “The Transition to a Market Economy: Pitfalls of Partial Planning Reform,” with Andrei Shleifer and Robert W. Vishny, 107 *Quarterly Journal of Economics* 889 (1992).
- “The Division of Labor, Coordination Costs, and Knowledge,” with Gary S. Becker, 107 *Quarterly Journal of Economics* 1137 (1992).
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"Estimating the Effect of the Crack Epidemic," with Steve Levitt and Roland Fryer, Unpublished Working Paper (September 2006).

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"On the Economics of Climate Policy," with Gary S. Becker and Robert H. Topel, Working Paper No. 234 (January 2010, Revised September 2010).

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"Competitive Discounts and Antitrust Policy," with Edward Snyder and Robert Topel (March 2013).

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“The Education Gap Rap,” *The American Enterprise*, (March-April 1990), pp. 62.

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“Growing inequality and the economics of fragmentation,” by David Warsh, *Boston Sunday Globe*, August 21, 1994, pp. A1. Two-page article with picture and biographical details about Murphy and his research; part of a series about “how the new generation replaced the old in economics.”

“A Pay Raise’s Impact,” by Louis Uchitelle. *New York Times*, January 12, 1995, Business Section pp. 1. Article about consequences of proposed increase in the minimum wage. Articles featuring Murphy's comments on the minimum wage appeared in numerous other publications, including the *Chicago Tribune*; in addition, Murphy was interviewed on CNN (January 26, 1995).

“The Undereducated American,” *Wall Street Journal*, August 19, 1996, pp. A12. Changes in the rate of returns to education.

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Testimony, Reports, and Depositions (Last 4 Years)

Final Submission of Kevin M. Murphy, January 16, 2009, in the 2006 MSA Adjustment Proceeding.

Expert Report of Kevin M. Murphy, January 23, 2009, in the Matter of City of New York v. Amerada Hess Corp., et al., The United States District Court for the Southern District of New York. Report submitted on behalf of Citgo Petroleum Corporation.

Declaration of Kevin M. Murphy, January 29, 2009, in the Matter of Insignia Systems, Inc. v. News America Marketing In-Store, Inc., The United States District Court for the District of Minnesota.

Deposition of Kevin M. Murphy, February 10, 2009, in the Matter of Valassis Communications, Inc. v. News America Incorporated, a/k/a News America Marketing Group, News America FSI, Inc. a/k/a News America Marketing FSI, LLC and News America Marketing In-Store Services, Inc. a/a/a News American Marketing In-Store Services, LLC., The United States Third Circuit Court of Michigan Detroit Division. Case No. 07-706645.

Expert Report of Kevin M. Murphy, February 13, 2009, in the Matter of City of New York v. Amerada Hess Corp., et al., The United States District Court for the Southern District of New York. Report submitted on behalf of Citgo Petroleum Corporation regarding Citgo's share of total RFG supply at the New York Harbor.

Expert Report of Kevin M. Murphy, March 3, 2009, in the Matter of St. Francis Medical Center, on behalf of itself and all others similarly situated vs. C.R. Bard, Inc., The United States District Court for the Eastern District of Missouri Southeastern Division.

Deposition of Kevin M. Murphy, March 6, 2009, in the Matter of St. Francis Medical Center, on behalf of itself and all others similarly situated vs. C.R. Bard, Inc., The United States District Court for the Eastern District of Missouri Southeastern Division.

Expert Report of Kevin M. Murphy, March 17, 2009, in the Matter of ZF Meritor LLC and Meritor Transmission Corporation v. Eaton Corporation., The United States District Court of Delaware. Case No. 06-CV-623.

Deposition of Kevin M. Murphy, April 6, 2009, in the Matter of ZF Meritor LLC and Meritor Transmission Corporation v. Eaton Corporation., The United States District Court of Delaware. Case No. 06-CV-623.

Declaration of Kevin M. Murphy, April 16, 2009, in the Matter of Sun Microsystems, Inc., a California corporation v. Hynix Semiconductor Inc., et al., The United States District Court Northern District of California San Francisco Division.

Declaration of Kevin M. Murphy, April 23, 2009, in the Matter of Sun Microsystems, Inc., a California corporation v. Hynix Semiconductor Inc., a Korean corporation, Hynix Semiconductor America Inc., a California corporation, et al., The United States District Court Northern District of California San Francisco Division.

Expert Report of Kevin M. Murphy, May 11, 2009, in the Matter of Jim Hood, Attorney General ex rel State of Mississippi v. Microsoft Corporation., The Chancery Court of Hinds County First Judicial District.

Expert Report of Professor Kevin M. Murphy, June 12, 2009, in the Matter of CITGO Petroleum Corporation v. Ranger Enterprises, Inc., The United States District Court for the Western District of Wisconsin.

Expert Report of Kevin M. Murphy, June 24, 2009, in the Matter of Novell, Incorporated v. Microsoft Corporation., The United States District Court Northern District of Maryland.

Trial Testimony of Kevin M. Murphy, July 16, 2009, in the Matter of Valassis Communications, Inc. v. News America Incorporated, a/k/a News America Marketing Group, News America FSI, Inc. a/k/a News America Marketing FSI, LLC and News America Marketing In-Store Services, Inc. a/a/a News American Marketing In-Store Services, LLC., The United States Third Circuit Court of Michigan Detroit Division. Case No. 07-706645.

Declaration of Kevin M. Murphy, August 14, 2009, in the Matter of EBay Seller Antitrust Litigation, The United States District Court for the Northern District of California. Declaration submitted in support of defendant Ebay Inc.'s motion for summary judgment.

Expert Report of Kevin M. Murphy, August 21, 2009, in the Matter of Go Computer, Inc., and S. Jerrold Kaplan v. Microsoft Corporation., The Superior Court for the State of California for the City and County of San Francisco.

Deposition of Kevin M. Murphy, September 16, 2009, in the Matter of Novell, Incorporated v. Microsoft Corporation., The United States District Court Northern District of Maryland.

Deposition of Kevin M. Murphy, September 21, 2009, in the Matter of Ebay Seller Antitrust Litigation, The United States District Court for the Northern District of California. Deposition in support of defendant Ebay Inc.'s motion for summary judgment.

Expert Report of Kevin M. Murphy, September 29, 2009, in the Matter of Motor Fuel Temperature Sales Litigation, The United States District Court of Kansas.

Trial Testimony of Kevin M. Murphy, October 1, 2009, in the Matter of ZF Meritor LLC and Meritor Transmission Corporation v. Eaton Corporation., The United States District Court of Delaware. Case No. 06-CV-623.

Declaration of Kevin M. Murphy, October 16, 2009, in the Matter of Ebay Seller Antitrust Litigation, The United States District Court for the Northern District of California. Declaration in further support of defendant Ebay Inc.'s motion for summary judgment.

Expert Report of Kevin M. Murphy, October 20, 2009, in the Matter of Advanced Micro Devices, Inc., and AMD International Sales & Service, LTD v. Intel Corporation and Intel Kabushiki Kaisha., The United States District Court for the District of Delaware.

Deposition of Kevin M. Murphy, October 24, 2009, in the Matter of Go Computer, Inc., and S. Jerrold Kaplan v. Microsoft Corporation., The Superior Court for the State of California for the City and County of San Francisco.

Deposition of Kevin M. Murphy, October 26, 2009, in the Matter of Motor Fuel Temperature Sales Litigation, The United States District Court of Kansas.

Expert Report of Kevin M. Murphy, December 14, 2009, in the Matter of Payment Card Interchange Fee and Merchant Discount Antitrust Litigation, The United States District Court for the Eastern District of New York.

Supplemental Expert Report of Kevin M. Murphy, December 21, 2009, in the Matter of Valassis Communications, Inc. v. News America Incorporated, a/k/a News America Marketing Group, News America FSI, Inc. a/k/a News America Marketing FSI, LLC and News America Marketing In-Store Services, Inc. a/a/a News American Marketing In-Store Services, LLC., The United States Third Circuit Court of Michigan Detroit Division. Case No. 07-706645.

Trial Testimony of Kevin M. Murphy, January 11, 2010, in the Matter of Go Computer, Inc., and S. Jerrold Kaplan v. Microsoft Corporation., The Superior Court for the State of California for the City and County of San Francisco.

Supplemental Rebuttal Expert Report of Kevin M. Murphy, January 14, 2010, in the Matter of Valassis Communications, Inc. v. News America Incorporated, a/k/a News America Marketing Group, News America FSI, Inc. a/k/a News America Marketing FSI, LLC and News America Marketing In-Store Services, Inc. a/a/a News American Marketing In-Store Services, LLC., The United States Third Circuit Court of Michigan Detroit Division. Case No. 07-706645.

Deposition of Kevin M. Murphy, January 26, 2010, in the Matter of Valassis Communications, Inc. v. News America Incorporated, a/k/a News America Marketing Group, News America FSI, Inc. a/k/a News America Marketing FSI, LLC and News America Marketing In-Store Services, Inc. a/a/a News American Marketing In-Store Services, LLC., The United States Third Circuit Court of Michigan Detroit Division. Case No. 07-706645.

Declaration of Kevin M. Murphy, January 28, 2010, in the Matter of Automobile Antitrust Cases I and II., The United States Superior Court of the State of California for the County of San Francisco.

Declaration of Kevin M. Murphy, April 2, 2010, in the Matter of the Application for the Determination of Interim License Fees for The Cromwell Group, Inc. and Affiliates, et al., The United States District Court Southern District of New York.

Deposition of Kevin M. Murphy, April 13-14, 2010, in the Matter of Payment Card Interchange Fee and Merchant Discount Antitrust Litigation., The United States District Court for the Eastern District of New York.

Supplemental Expert Report of Kevin M. Murphy, June 1, 2010, in the Matter of Insignia Systems, Inc. v. News America Marketing In-Store, Inc. (corrected June 8, 2010)., The United States District Court for the District of Minnesota.

Expert Report of Kevin M. Murphy, June 21, 2010, in the Matter of Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc., for Consent to Assign Licenses or Transfer Control of Licensees., Federal Communications Commission.

Supplement to Expert Report of Kevin M. Murphy, June 24, 2010, in the Matter of Payment Card Interchange Fee and Merchant Discount Antitrust Litigation., The United States District Court for the Eastern District of New York.

Second Supplemental Expert Report of Kevin M. Murphy, July 6, 2010, in the Matter of Insignia Systems, Inc. v. News America Marketing In-Store, Inc., The United States District Court for the District of Minnesota.

Deposition of Kevin M. Murphy, July 8, 2010, in the Matter of Insignia Systems, Inc. v. News America Marketing In-Store, Inc., The United States District Court for the District of Minnesota.

Expert Report of Kevin M. Murphy, July 28, 2010, in the Matter of Commonwealth of Pennsylvania by Thomas W. Corbett, Jr., in his capacity as Attorney General of the Commonwealth of Pennsylvania v. TAP Pharmaceutical Products, Inc., et al., in the Commonwealth Court of Pennsylvania, No. 212 MD 2004.

Response of Kevin M. Murphy to Reply Report of Mark Israel and Michael Katz, August 19, 2010, in the Matter of Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc., for Consent to Assign Licenses or Transfer Control of Licensees., Federal Communications Commission.

Expert Report of Kevin M. Murphy, September 14, 2010, in the Matter of City of St. Louis, et al. v. American Tobacco Co., et al., The Circuit Court of the City of St. Louis State of Missouri.

Deposition of Kevin M. Murphy, September 24, 2010, in the Matter of City of St. Louis, et al. v. American Tobacco Co., et al., The Circuit Court of the City of St. Louis State of Missouri.

Supplemental Expert Report of Kevin M. Murphy, September 30, 2010, in the Matter of Commonwealth of Pennsylvania by Thomas W. Corbett, Jr., in his capacity as Attorney General of the Commonwealth of Pennsylvania v. TAP Pharmaceutical Products, Inc., et al., in the Commonwealth Court of Pennsylvania, No. 212 MD 2004.

Expert Report of Kevin M. Murphy, October 1, 2010, in the Matter of State of New Hampshire v. Hess Corporation, et al., The State of New Hampshire Superior Court.

Expert Report of Kevin M. Murphy, October 4, 2010, in the Matter of the Arbitration between Cordis Corporation and Abbott Vascular., CPR International Institute for Conflict Prevention & Resolution.

Deposition of Kevin M. Murphy, October 7, 2010, in the Matter of the Arbitration between Cordis Corporation and Abbott Vascular., CPR International Institute for Conflict Prevention & Resolution.

Trial Testimony of Kevin M. Murphy, November 8, 2010, in the Matter of the Arbitration between Cordis Corporation and Abbott Vascular., CPR International Institute for Conflict Prevention & Resolution.

Declaration of Kevin M. Murphy, November 12, 2010, in the Matter of RWJ Management Company, Inc. v. BP Products North America, Inc., The United States District Court for the Northern District of Illinois Eastern Division.

Expert Report of Kevin M. Murphy, November 15, 2010, in the Matter of RWJ Management Company, Inc. v. BP Products North America, Inc., The United States District Court for the Northern District of Illinois Eastern Division.

Expert Report of Kevin M. Murphy, November 19, 2010, in the Matter of Craft, et al., v. Philip Morris Companies, Inc., a corporation, and Philip Morris Incorporated, a corporation, Missouri Circuit Court, Twenty-Second Judicial District (City of St. Louis), Case No. 002-00406-02.

Economic Analysis of Kevin M. Murphy to Guide Interpretation of Provisions of the Dodd-Frank Act Regarding Regulation of Debit Interchange Fees, November 23, 2010, submission on behalf of Bank of America Corporation.

Comments of Kevin M. Murphy on the November 10, 2010 Report of Drs. Mark Israel and Michael L. Katz, November 24, 2010, in the Matter of Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc., for Consent to Assign Licenses or Transfer Control of Licensees., Federal Communications Commission.

Expert Report of Kevin M. Murphy, November 29, 2010, in the Matter of Reggie White, et al., v. NFL: Lockout Insurance & Lockout Loans., The United States District Court District of Minnesota.

Deposition of Kevin M. Murphy, December 3, 2010, in the Matter of Reggie White, et al., v. NFL: Lockout Insurance & Lockout Loans., The United States District Court District of Minnesota.

Deposition of Kevin M. Murphy, December 13, 2010, in the Matter of RWJ Management Company, Inc. v. BP Products North America, Inc., The United States District Court for the Northern District of Illinois Eastern Division.

Deposition of Kevin M. Murphy, January 17-18, 2011, in the Matter of Craft, et al., v. Philip Morris Companies, Inc., a corporation, and Philip Morris Incorporated, a corporation, Missouri Circuit Court, Twenty-Second Judicial District (City of St. Louis), Case No. 002-00406-02.

Report of Kevin M. Murphy, February 15, 2011, submitted by TCF Financial Corporation on February 16, 2011 to the Subcommittee on Financial Institutions and Consumer Credit of the Committee on Financial Services of the U.S. House of Representatives.

Declaration of Kevin M. Murphy, March 2, 2011, in the Matter of TCF National Bank v. Ben S. Bernanke, Janet L. Yellen, Kevin M. Warsh, Elizabeth A. Duke, Daniel K. Tarullo and Sarah Bloom Raskin, the Board of Governors of the Federal Reserve System, in their official capacities; and John Walsh, Comptroller of the Currency, in his official capacity.

Expert Report of Kevin M. Murphy, April 11, 2011, in the Matter of Datel Holdings, LTD., and Datel Design & Development, Inc., v. Microsoft Corporation., The United States District Court Northern District of California.

Declaration of Kevin M. Murphy, May 26, 2011, filed with the National Labor Relations Board on behalf of the National Basketball Players Association.

Deposition of Kevin M. Murphy, June 14, 2011, in the Matter of Datel Holdings, LTD., and Datel Design & Development, Inc., v. Microsoft Corporation., The United States District Court Northern District of California.

Expert Report of Kevin M. Murphy, July 1, 2011, in the Matter of Certain Gaming and Entertainment Consoles, Related Software, and Components Thereof., The United States International Trade Commission.

Expert Report of Kevin M. Murphy, August 17, 2011, in the Matter of American Airlines, Inc. v. Sabre Inc., et al., The Judicial District of Tarrant County, Texas 67th Judicial District.

Expert Report of Kevin M. Murphy, August 19, 2011, in the Matter of Motor Fuel Temperature Sales Litigation, The United States District Court for the District of Kansas.

Deposition of Kevin M. Murphy, September 6, 2011, in the Matter of Certain Gaming and Entertainment Consoles, Related Software, and Components Thereof., The United States International Trade Commission.

Expert Report of Kevin M. Murphy, September 9, 2011, in the Matter of State of New York v. Intel Corporation, The United States District Court for the District of Delaware.

Deposition of Kevin M. Murphy, September 14, 2011, in the Matter of Motor Fuel Temperature Sales Litigation, The United States District Court for the District of Kansas.

Direct Testimony of Kevin M. Murphy, September 27, 2011, in the Matter of Certain Gaming and Entertainment Consoles, Related Software, and Components Thereof., The United States International Trade Commission.

Deposition of Kevin M. Murphy, October 8-10, 2011, in the Matter of State of New York v. Intel Corporation, The United States District Court for the District of Delaware.

Report of Kevin M. Murphy, October 10, 2011, in connection with dispute between NRLC and railroad employees, National Mediation Board Case Nos. A-13569; A-13570; A-13572; A-13573; A-13574; A-13575; A-13592, before Emergency Board No. 243.
Hearing Testimony of Kevin M. Murphy, October 13, 2011, in connection with dispute between NRLC and railroad employees, National Mediation Board Case Nos. A-13569; A-13570; A-13572; A-13573; A-13574; A-13575; A-13592, before Emergency Board No. 243.

Expert Report of Kevin M. Murphy, October 17, 2011, in the Matter of State of New Hampshire v. Hess Corporation, et al., The State of New Hampshire Superior Court.

Declaration of Kevin M. Murphy, December 1, 2011, the Matter of Motor Fuel Temperature Sales Litigation, The United States District Court for the District of Kansas.

Expert Report of Kevin M. Murphy, December 5, 2011, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Trial Testimony of Kevin M. Murphy, December 7-8, 2011, in the Matter of Novell, Incorporated v. Microsoft Corporation., The United States District Court Northern District of Maryland.

Trial Testimony of Kevin M. Murphy, December 29, 2011, in the Matter of RWJ Management Company, Inc. v. BP Products North America, Inc., The United States District Court for the Northern District of Illinois Eastern Division.

Supplemental Expert Report of Kevin M. Murphy, January 15, 2012, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Trial Testimony of Kevin M. Murphy, January 18, 2012, in the Matter of Certain Gaming and Entertainment Consoles, Related Software, and Components Thereof., The United States International Trade Commission.

Supplemental Expert Report of Kevin M. Murphy, February 23, 2012, in the Matter of State of New Hampshire v. Hess Corporation, et al., The State of New Hampshire Superior Court.

Affidavit of Kevin M. Murphy, March 12, 2012, in the Matter of Sharon Price and Michael Fruth, Individually and on Behalf of Others Similarly Situated vs. Philip Morris Incorporated, The United States Circuit Court, Third Judicial Court, Madison County, Illinois.

Declaration of Kevin M. Murphy, May 3, 2012, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Comments of Kevin M. Murphy of DirecTV, LLC, June 22, 2012, in the Matter of Revision of the Commission's Program Access Rules; News Corporation and the DIRECTV Group, Inc., Transferors, and Liberty Media Corporation, Transferee, for Authority to Transfer Control; Applications for Consent to the Assignment and/or Transfer of Control of Licenses, Adelphia Communications Corporation (and Subsidiaries, Debtors-in-Possession), Assignors, to Time Warner Cable, Inc. (Subsidiaries), Assignees, et al., Federal Communications Commission.

Expert Report of Kevin M. Murphy, July 20, 2012, in the Matter of American Airlines v. Sabre, Inc., Sabre Holdings Corp., and Sabre Travel International Ltd., The United States Judicial District Tarrant County, Texas 67th Judicial District.

Declaration of Kevin M. Murphy, July 21, 2012, in the Matter of Kirk Dahl v. Bain Capital Partners, LLC., The United States District Court District of Massachusetts.

Expert Report of Kevin M. Murphy, July 23, 2012, in the Matter of Kirk Dahl v. Bain Capital Partners, LLC., The United States District Court District of Massachusetts.

Expert Report of Kevin M. Murphy, July 24, 2012, in the Matter of Microsoft Corporation v. Motorola, Inc., The United States District Court Western District of Washington at Seattle.

Deposition of Kevin M. Murphy, August 22, 2012, in the Matter of Microsoft Corporation v. Motorola, Inc., The United States District Court Western District of Washington at Seattle.

"Economic Analysis of the Impact on DIRECTV's Subscribership of Carrying an RSN: Evidence from San Diego," August 31, 2012, submitted in the Matter of Revision of the Commission's Program Access Rules; News Corporation and the DIRECTV Group, Inc., Transferors, and Liberty Media Corporation, Transferee, for Authority to Transfer Control; Applications for Consent to the Assignment and/or Transfer of Control of Licenses, Adelphia Communications Corporation (and Subsidiaries, Debtors-in-Possession), Assignors, to Time Warner Cable, Inc. (Subsidiaries), Assignees, et al., Federal Communications Commission.)

Expert Report of Kevin M. Murphy, September 7, 2102, in the Matter of Willard R. Brown, et al. v. The American Tobacco Co., Inc., et al., Superior Court for the State of California for the County of San Diego.

Deposition of Kevin M. Murphy, September 14, 2012, in the Matter of Willard R. Brown, et al. v. The American Tobacco Co., Inc., et al., Superior Court for the State of California for the County of San Diego.

Deposition of Kevin M. Murphy, September 24, 2012, in the Matter of American Airlines Inc. v Sabre, Inc., Sabre Holdings Corp., and Sabre Travel International Ltd. for the State of Texas for the Judicial District of Tarrant County.

Expert Report of Kevin M. Murphy, October 10, 2012, in the Matter of Avery Dennison Corporation v. 3M Innovative Properties and 3M Company, The United States District Court for the District of Minnesota.

Expert Report of Kevin M. Murphy, November 12, 2012, in the Matter of Re High-Tech Employee Antitrust Litigation, The United States District Court Northern District of California San Jose Division.

Trial Testimony of Kevin M. Murphy, November 13, 2012, in the Matter of Microsoft Corporation v. Motorola Inc, The United States District Court Western District of Washington at Seattle.

Expert Report of Kevin M. Murphy, November 15, 2012, in the Matter of New Jersey Dep't of Env'tl. Prot., et al. v. Atlantic Richfield Co., et al., The United States District Court Southern District of New York.

Deposition of Kevin M. Murphy, December 3, 2012, in the Matter of Re High-Tech Employee Antitrust Litigation, The United States District Court Northern District of California San Jose Division

Expert Report of Kevin M. Murphy, December 21, 2012, in re: Titanium Dioxide Antitrust Litigation, The United States District Court for the District of Maryland.

Deposition of Kevin Murphy, January 16, 2013, in the Matter of Avery Dennison Corporation v. 3M Innovative Properties and 3M Company, The United States District Court for the District of Minnesota.

Amended Expert Report of Kevin M. Murphy, February 8, 2013, in the Matter of New Jersey Dep't of Env'tl. Prot., et al. v. Atlantic Richfield Co., et al, The United States District Court Southern District of New York.

Expert Report of Professor Kevin M. Murphy, February 8, 2013, in United States of America v. Apple Inc., et al., The United States District Court Southern District of New York.

Declaration of Kevin M. Murphy, February 22, 2013, in the Matter of Willard R. Brown, et al. v. The American Tobacco Co., Inc., et al., Superior Court for the State of California for the County of San Diego.

Rebuttal Expert Report of Kevin M. Murphy, March 1, 2013, in United States of America v. Apple Inc., et al., The United States District Court Southern District of New York.

Second Supplemental Expert Report of Kevin M. Murphy, March 8, 2013, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Direct Testimony of Kevin M. Murphy, April 26, 2013, in United States of America v. Apple Inc., et al., The United States District Court Southern District of New York (revised and resubmitted on May 29, 2013).

Declaration of Kevin M. Murphy, May 13, 2013, in the Matter of Brenda Blakeman v National Milk Producers Federation, et al., The United States District Court for the Southern District of Illinois.

Expert Report of Kevin M. Murphy, May 29, 2013, in the Matter of Microsoft Corporation v. Motorola, Inc., et al., The United States District Court Western District of Washington at Seattle.

Declaration of Kevin M. Murphy, June 6, 2013, in the Matter of WNET, Thirteen, Fox Television Stations, Inc.; Twentieth Century Fox Film Corporation, WPIX, Inc., Univision Television Group, Inc.; The Univision Network Limited Partnership, and Public Broadcasting Service v. Aereo, Inc. f/k/a Bamboom Labs, Inc., in The United States District Court for the Southern District of New York.

Expert Report of Kevin M. Murphy, June 7, 2013, in the Matter of Patrick Brady, et al., v. Airline Pilots Association, International, The United States District Court District of New Jersey.

Rebuttal Expert Report of Kevin M. Murphy, June 10, 2013, in the Matter of Microsoft Corporation v. Motorola, Inc., et al., The United States District Court Western District of Washington at Seattle.

Trial Testimony of Kevin M. Murphy, June 19, 2013, in United States of America v. Apple Inc., et al., The United States District Court Southern District of New York.

Supplemental Expert Report of Kevin M. Murphy, June 21, 2013, Re High-Tech Employee Antitrust Litigation, The United States District Court Northern District of California San Jose Division.

Trial Testimony of Kevin M. Murphy, July 1, 2013 and July 2, 2013, in re: Tobacco Cases II, Willard R. Brown, et al., v. The American Tobacco Company, et al., in The Superior Court of the State of California in and for The County of San Diego Central Division.

Expert Report of Kevin M. Murphy, July 3, 2013, in re: Text Messaging Antitrust Litigation, in The United States District Court For the Northern District of Illinois Eastern Division.

Video Deposition of Kevin M. Murphy, July 5, 2013, in re: High-Tech Employee Antitrust Litigation, in United States District Court Northern District of California San Jose Division.

Expert Report of Kevin M. Murphy, July 19, 2013, in The Apple iPod iTunes Antitrust Litigation, in The United States District Court For the Northern District of California Oakland Division.

Trial Testimony of Kevin M. Murphy, August 29, 2013 and August 30, 2013, in the Matter of Microsoft Corporation v. Motorola, Inc., et al., The United States District Court Western District of Washington at Seattle.

Trial Testimony of Kevin M. Murphy, September 17, 2013, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Deposition of Kevin M. Murphy, September 26, 2013, in re: Text Messaging Antitrust Litigation, in The United States District Court For the Northern District of Illinois Eastern Division

Expert Report of Kevin M. Murphy, September 27, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Rebuttal Expert Report of Kevin M. Murphy, October 21, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Expert Report of Kevin M. Murphy, October 21, 2013, in the Matter of Mary A. Carroll and Betty C. Lynn, et al., v. Philip Morris USA, Inc., et al., Superior Court for the State of Delaware in and for New Castle County.

Deposition of Kevin M. Murphy, November 2, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Rebuttal Expert Report of Kevin M. Murphy, November 8, 2013, in the Matter of US Airways, Inc. v. Sabre Holdings Corp., Sabre, Inc., and Sabre Travel International Ltd., in The United States District Court for the Southern District of New York.

Deposition of Kevin M. Murphy, November 12, 2013, in The Apple iPod iTunes Antitrust Litigation, in The United States District Court for the Northern District of California Oakland Division.

Expert Report of Kevin M. Murphy, November 18, 2013, in the Matter of WNET, Thirteen, Fox Television Stations, Inc.; Twentieth Century Fox Film Corporation, WPIX, Inc., Univision Television Group, Inc., The Univision Network Limited Partnership, and Public Broadcasting Service v. Aereo, Inc. f/k/a Bamboom Labs, Inc., in The United States District Court for the Southern District of New York.

Direct Testimony of Kevin M. Murphy, November 18, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Expert Report of Kevin M. Murphy, November 25, 2013, in the Matter of Re High-Tech Employee Antitrust Litigation, in The United States District Court for the Northern District of California San Jose Division.

Deposition of Kevin M. Murphy, December 7, 2013, in the Matter of Re High-Tech Employee Antitrust Litigation, in The United States District Court for the Northern District of California San Jose Division.

Appendix B

Robert H. Topel

CURRICULUM VITAE

December, 2013

CURRENT POSITIONS

Isidore Brown and Gladys J. Brown Distinguished Service Professor of Economics,
Booth School of Business, University of Chicago
Director, George J. Stigler Center for the Study of the Economy and the State
Co-Director, Energy Policy Institute at Chicago (EPIC)
Research Associate, National Bureau of Economic Research

EDUCATION

B.A. (with High Honors), University of California, Santa Barbara, 1974
Ph.D., University of California, Los Angeles, 1980

FIELDS OF SPECIALIZATION

Microeconomics, Labor Economics, Industrial Organization, Health Economics,
Economic Policy, Energy Economics, National Security Economics

PREVIOUS ACADEMIC POSITIONS

Professor of Economics, Graduate School of Business, University of Chicago, 1986-93

Kirby Distinguished Visiting Professor of Economics, Texas A&M University, 2006
Professor of Economics, Department of Economics, University of California, Los Angeles, 1986

Associate Professor of Economics, Department of Economics, University of California, Los Angeles, 1985-86

Associate Professor of Economics, Graduate School of Business, University of Chicago, 1983-85

Assistant Professor of Economics, Department of Economics, University of Chicago, 1980-83

OTHER AFFILIATIONS

Research Associate, National Bureau of Economic Research, 1984—present

Senior Fellow, the Milken Institute, 1999—present

Faculty Member, MacLean Center for Clinical Medical Ethics, University of Chicago
Member, National Petroleum Council Taskforce on Transportation Fuels Supply and Infrastructure, 2010-2012

Fellow, Center for the Study of Poverty and Inequality, Stanford University, 2006-present

Member, Brookings Panel on Economic Activity, various years.

Visiting Scholar, Board of Governors of the Federal Reserve, 1990
Research Associate, Economics Research Center, NORC, 1980—1990
Consulting Economist, The Rand Corporation, 1982—1989
Research Associate, Center for the Study of the Economy and the State, 1980—present
Faculty Research Fellow, National Bureau of Economic Research, 1981-83
Research Economist, Unicon Corporation, 1981-88
Consultant, U.S. Department of Labor, 1985-90
Partner, Chicago Partners LLC 1994-2008
Principal & Managing Director, Navigant Economics, 2008-2013
Board of Directors, Ingalls Hospitals and Ingalls Health Service, 2000-2012
Director, WGA Evans Scholars Foundation, 2011-present
Senior Consultant, Charles River Associates, 2013-present

EDITORIAL POSITIONS

Editor, *Journal of Political Economy*, 1993-2003
Board of Editors, *American Economic Review*, 1992-94
Associate Editor, *Journal of Labor Economics*, 1982-92
Editorial Board, *International Journal of the Economics of Business*, 1993-present
Member of the Advisory Board, ERN Labor Journals, 1998-present

HONORS & AWARDS

Kenneth J. Arrow Award, International Health Economics Association, 2007
Kirby Distinguished Visiting Professor, Texas A&M University, 2006
Research America Eugene Garfield Prize for Medical and Health Research, 2005
Elected Fellow, Society of Labor Economists, 2004
Elected Member, Conference on Research in Income and Wealth
Elected Founding Member, National Academy of Social Insurance
William Ladany Research Scholar, University of Chicago, 1989-91
William Fishman Research Scholar, University of Chicago, 1986-87
Smith Richardson Dissertation Fellowship in Political Economy, 1978-79
Foundation for Research in Economics and Education Fellowships, 1975-79
Chancellor's Intern Fellow, University of California, Los Angeles, 1975-79
University Fellow, Northwestern University, 1975
General Electric Dissertation Fellowship, 1978

TEACHING EXPERIENCE

Graduate Economic Theory I, II, III
Law, Economics and Business
Competitive Strategy
Advanced Topics in Labor Economics
Advanced Topics in Microeconomics
Managing the Workplace
Industrial Organization/Antitrust
Price Theory

OTHER PROFESSIONAL ACTIVITIES

Thompson Lecture (Keynote Address), Midwest Economic Association, 2000
Nominating Committee, American Economic Association, 1996, 1997
Program Committee, American Economic Association, 2006-2007.
Organizer, Universities-NBER Research Conference: "Labor Markets in the 1990s," Cambridge, December 1989.
Program Chair, Labor Economics, Econometric Society Meetings, December 1989.
National Science Foundation Review Panel in Economics, 1998, 1999
Inaugural Keynote Lecture, Missouri Economics Conference, University of Missouri, 2001
Pihl Lecturer, Wayne State University, November, 2004
Keynote Address, Federal Reserve Bank of Cleveland Conference on Education and Economic Development, November, 2004
Kirby Lecturer, Texas A&M University, 2006
Huggins Lecturer, Department of Surgery Huggins Conference, University of Chicago, May, 2007
Keynote Address, Conference Board of Canada Conference on Medical Research, Montreal, January 2009
Keynote Address, Council on Competitiveness Conference on Energy Policy, Argonne National Laboratory, May 2009
Keynote Address, University of Chicago/RFF/University of Illinois Conference on *Energy Policy and the Economy*, Washington, D.C., January 2010
Keynote Address, Humana Health Economics Forum, Santa Fe Institute, 2011
Keynote Address, Toyota Sustainability Conference, La Jolla, 2011
Keynote Address, Conference on Health Policy, Arizona State University, 2013

UNIVERSITY SERVICE

Director, Undergraduate Program in Economics, 1980-83
Chairman, Graduate School of Business Curriculum Review, 1990-91
Committee on Graduate Education, 1992-94
Committee on Undergraduate Education, 1993-94
Council of the University Senate, 1992-94, 1995-97, 1999-2002, 2004-2007, 2010-
Committee of the Council of the University Senate, 2000-2002, 2006-2007
Graduate School of Business Policy Committee, 1995-97, 1999-2001
Member, Presidential Search Committee, 1999-2000
Board of Directors, University of Chicago Laboratory Schools, 1986-92, 1998-2007
Chairman, Director Search Committee, U of C Laboratory Schools, 2002-2003
Area Coordinator, PhD Program in Economics, 2002-2008
Director, George J. Stigler Center, 2007-present
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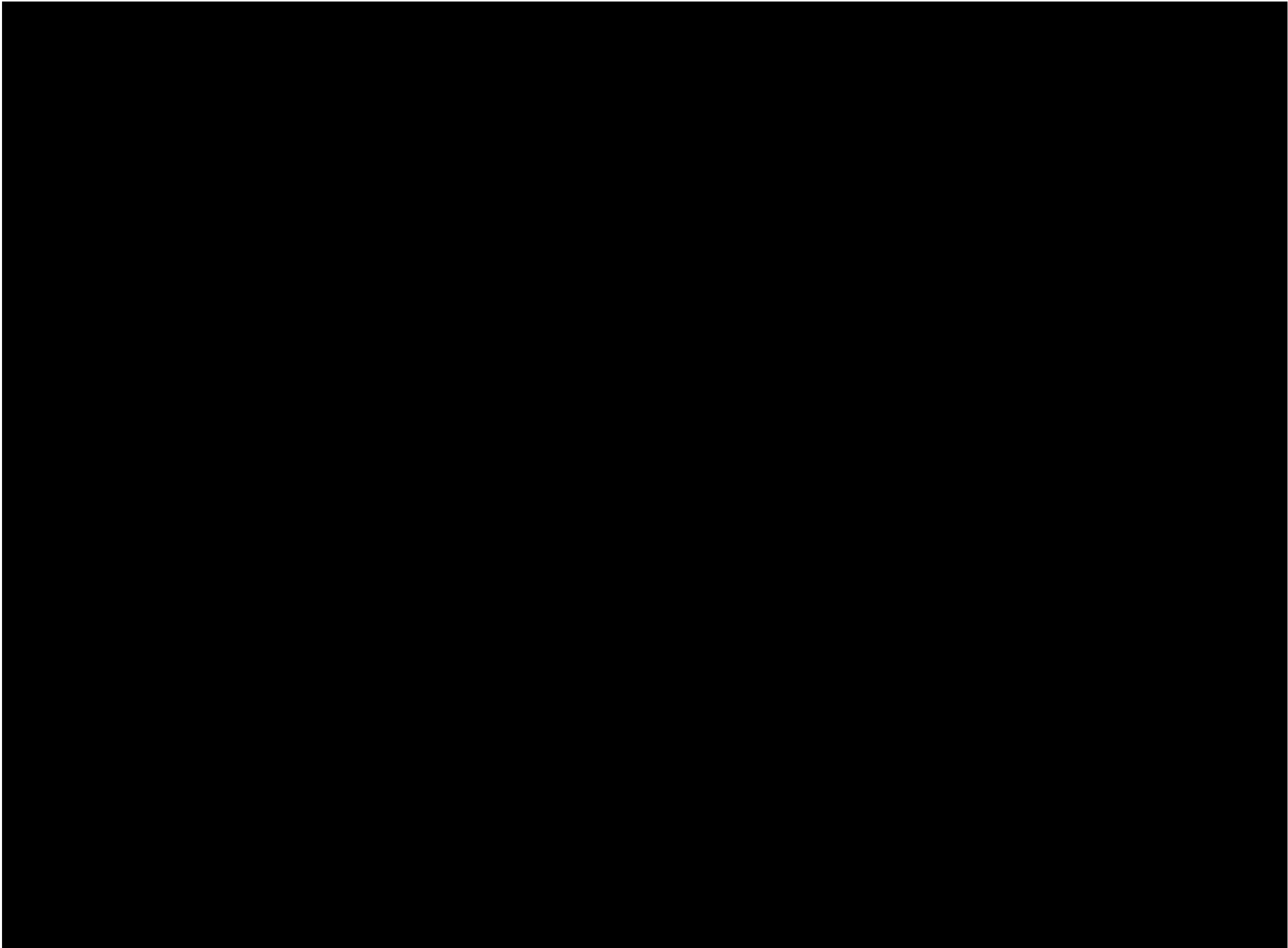
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Appendix C

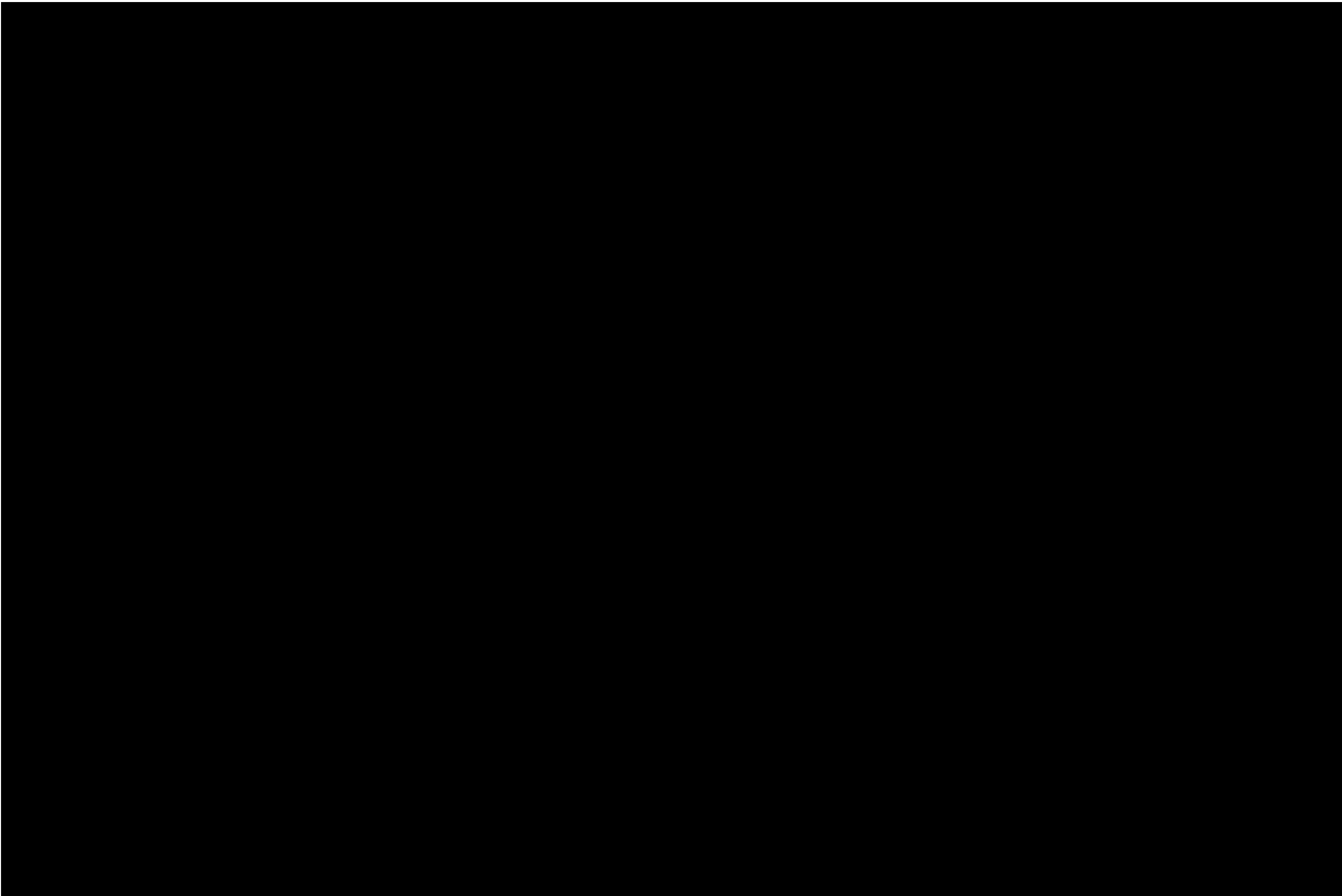
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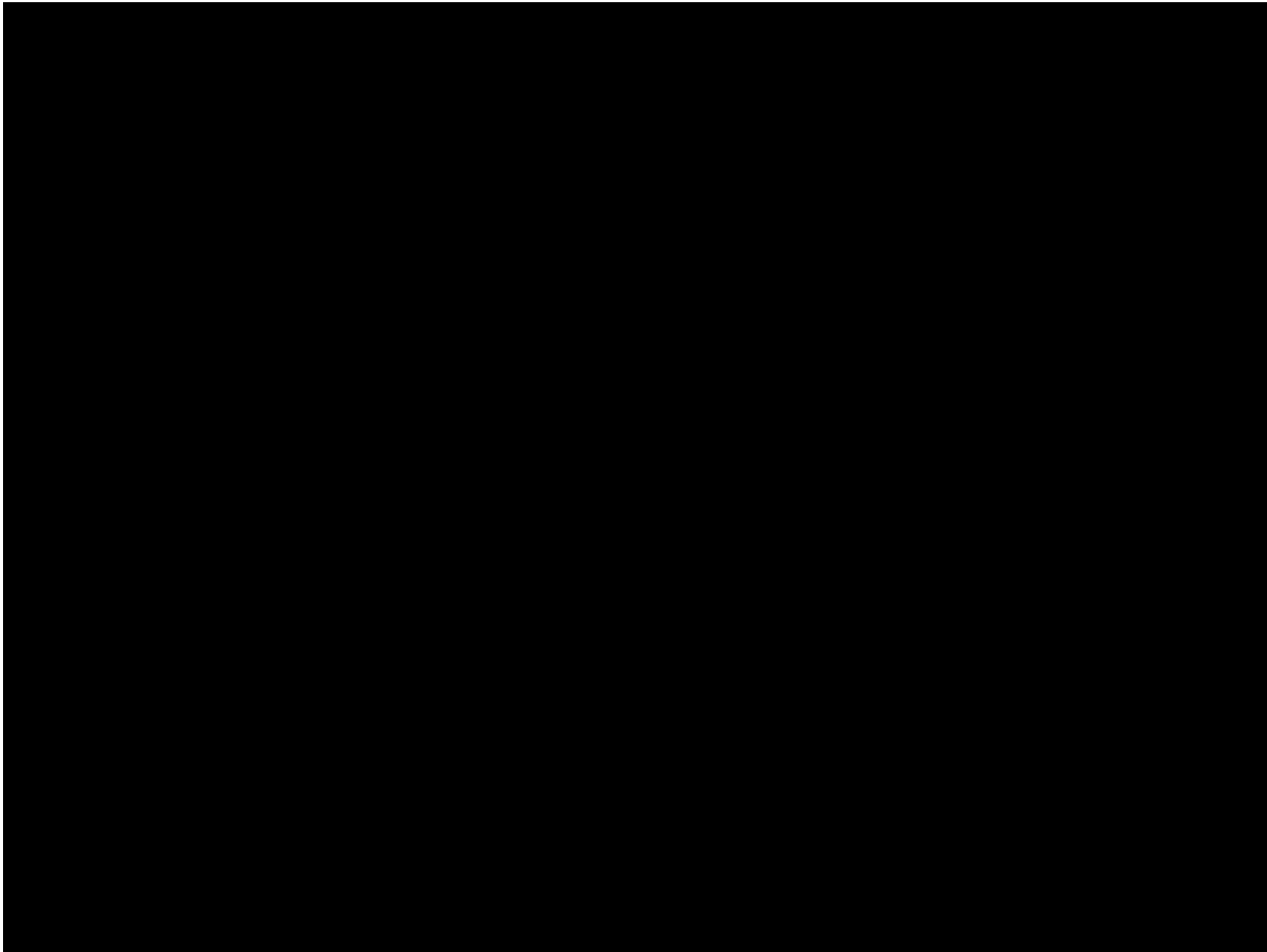
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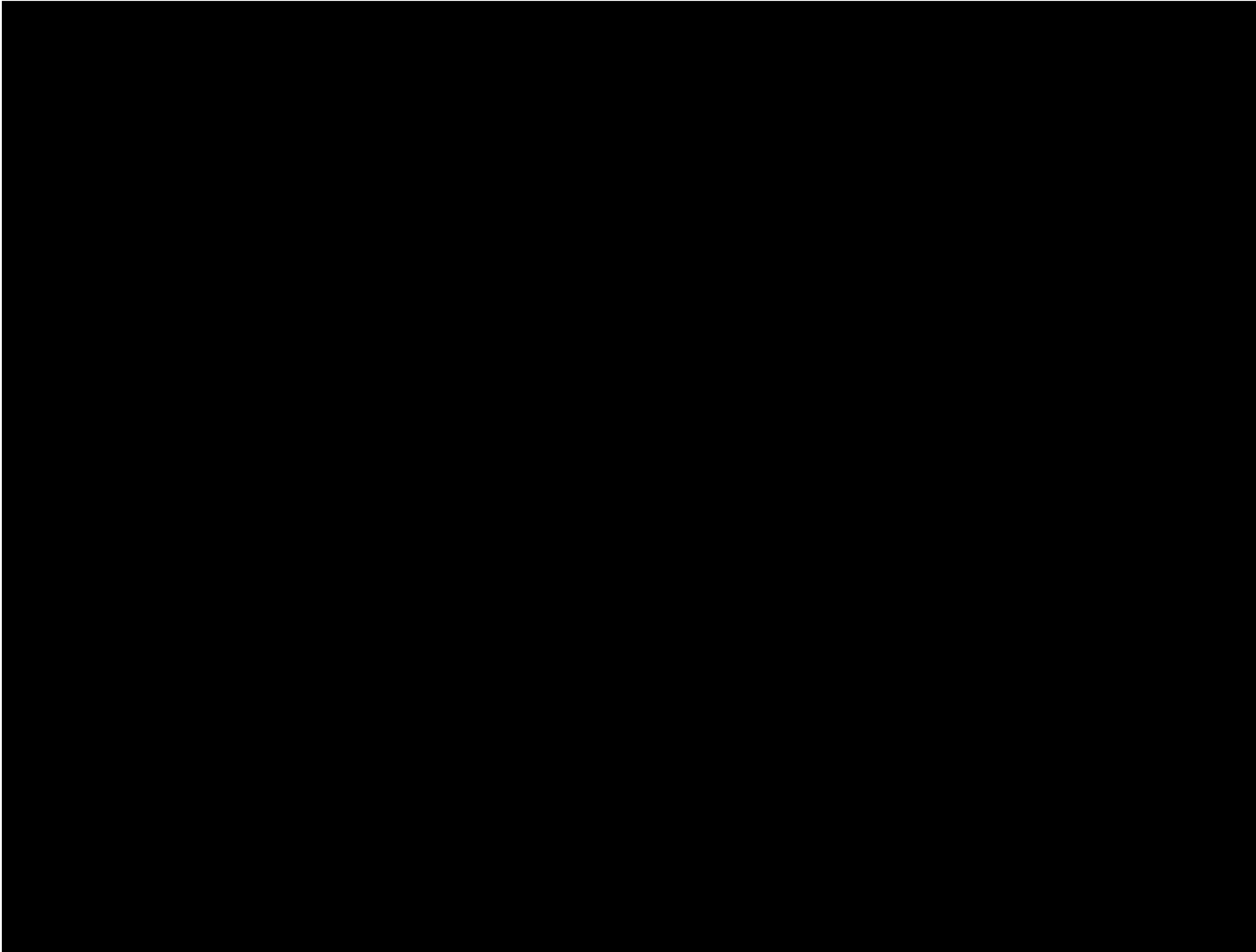
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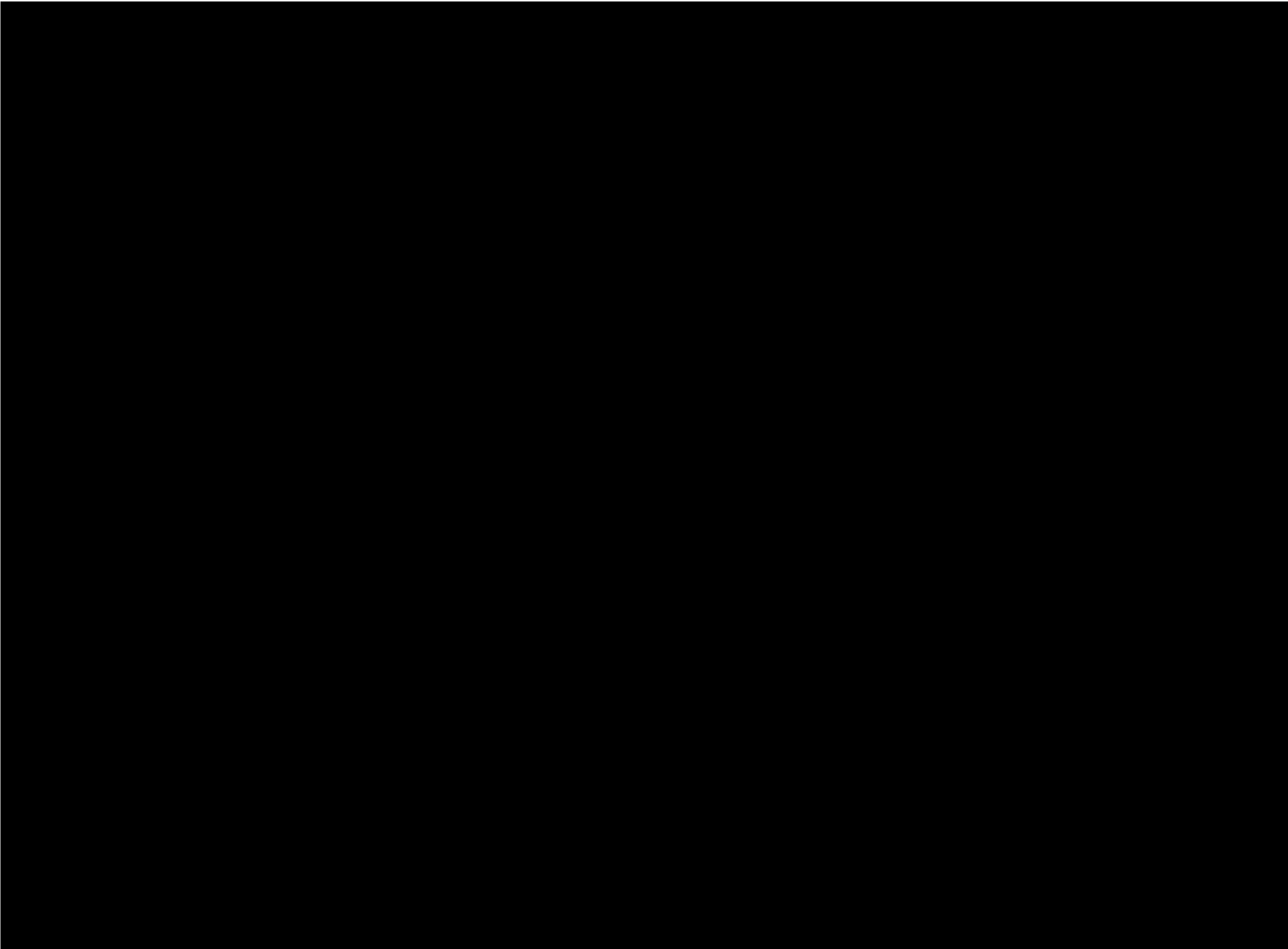
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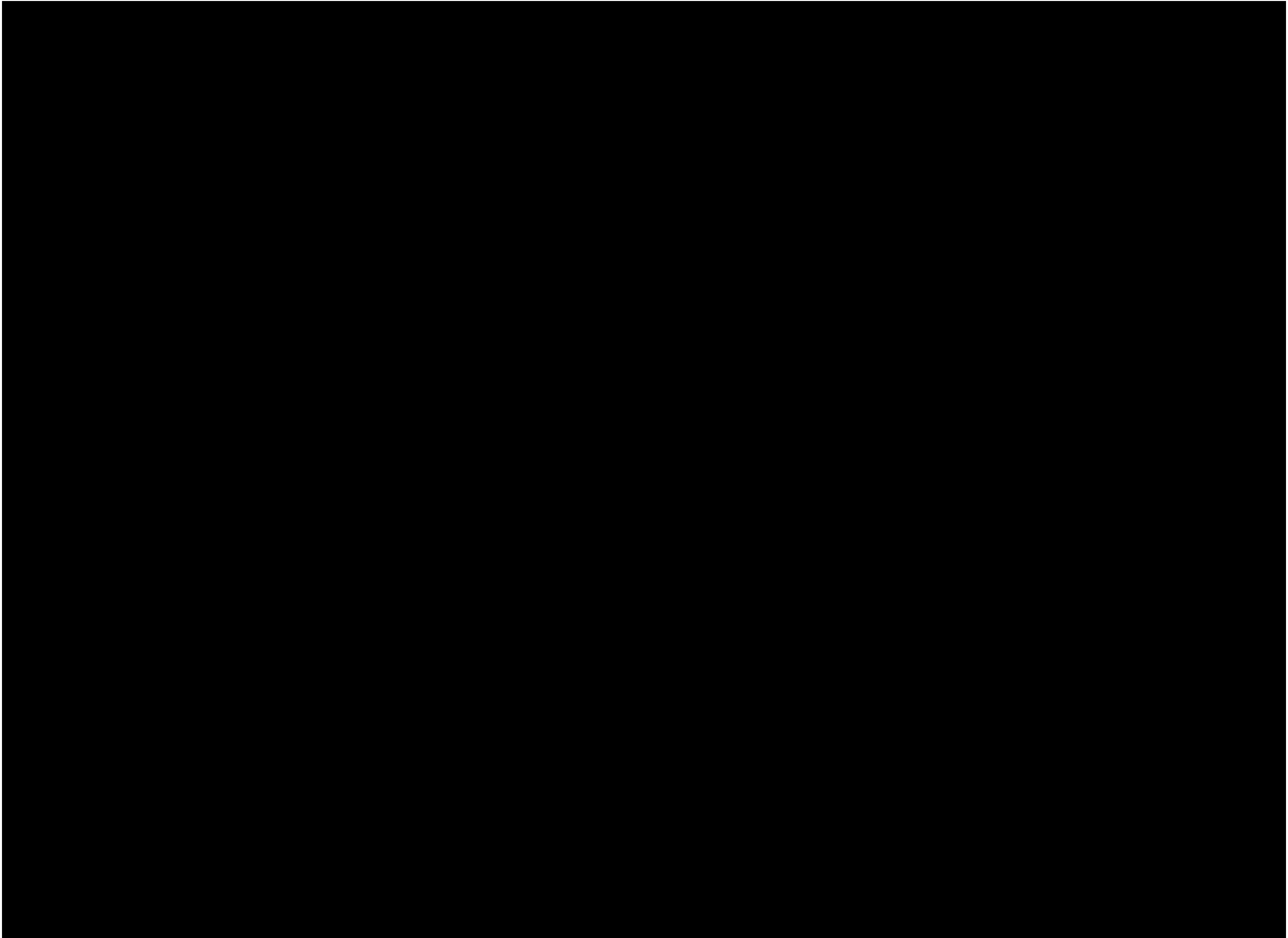




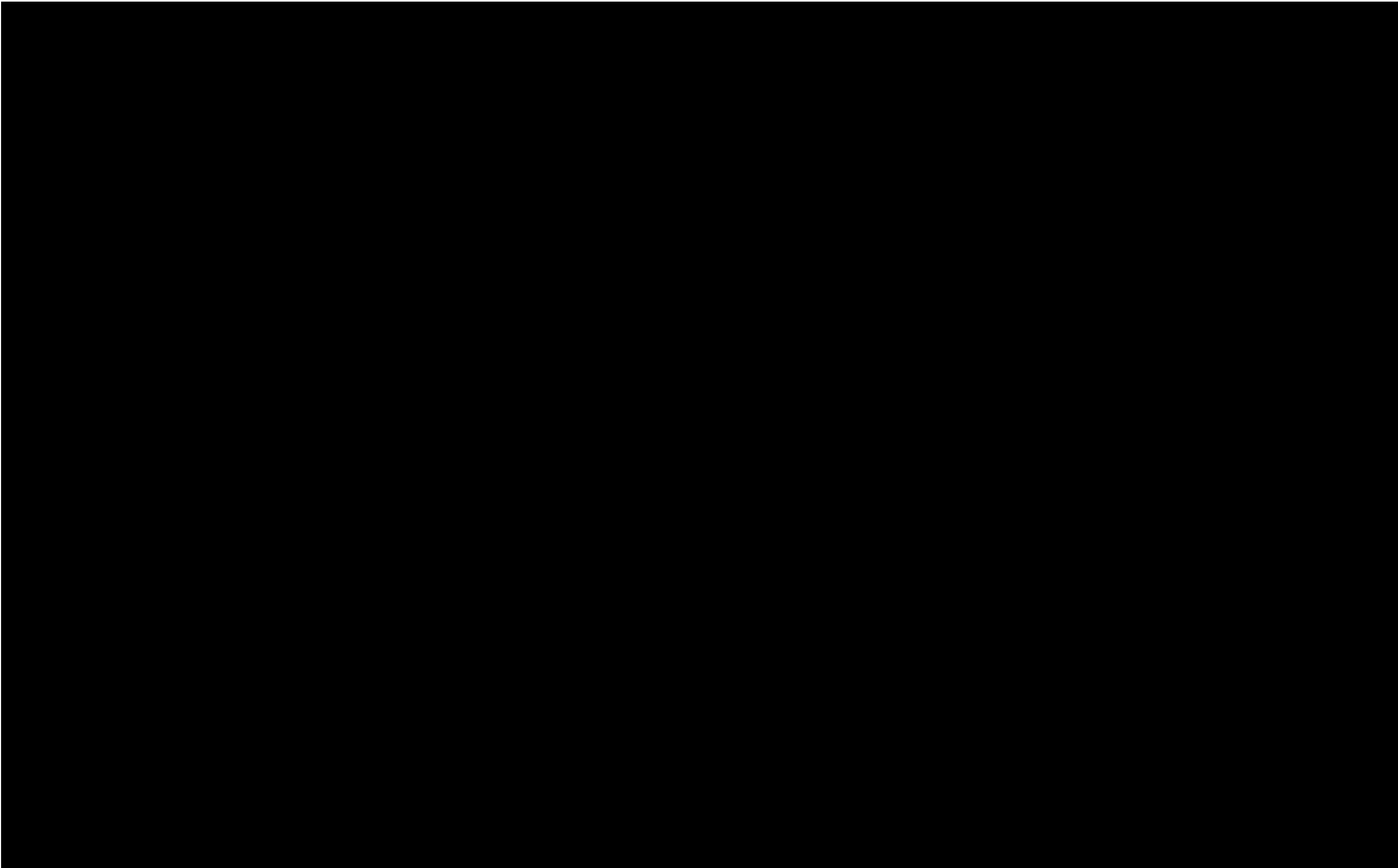
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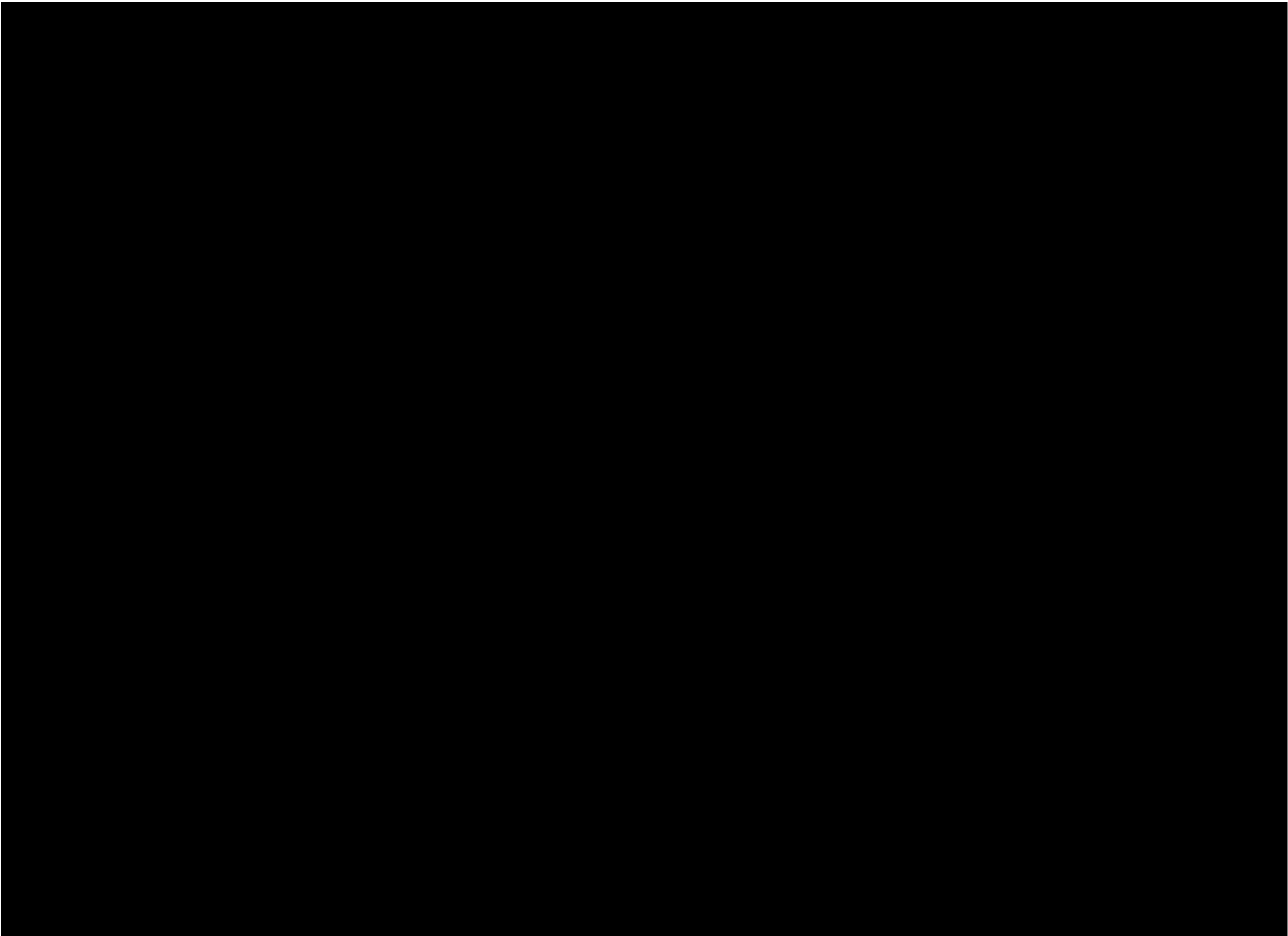
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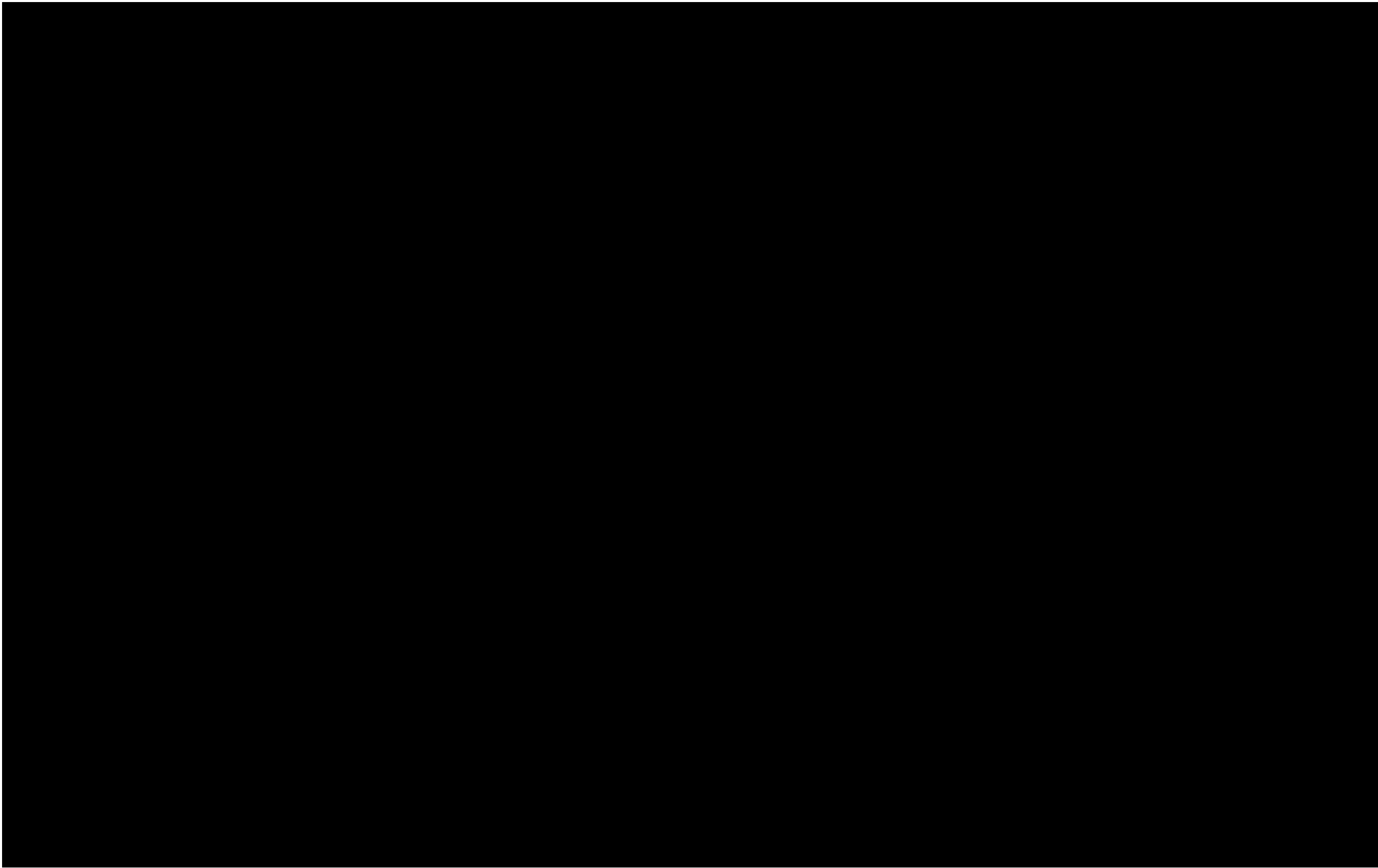


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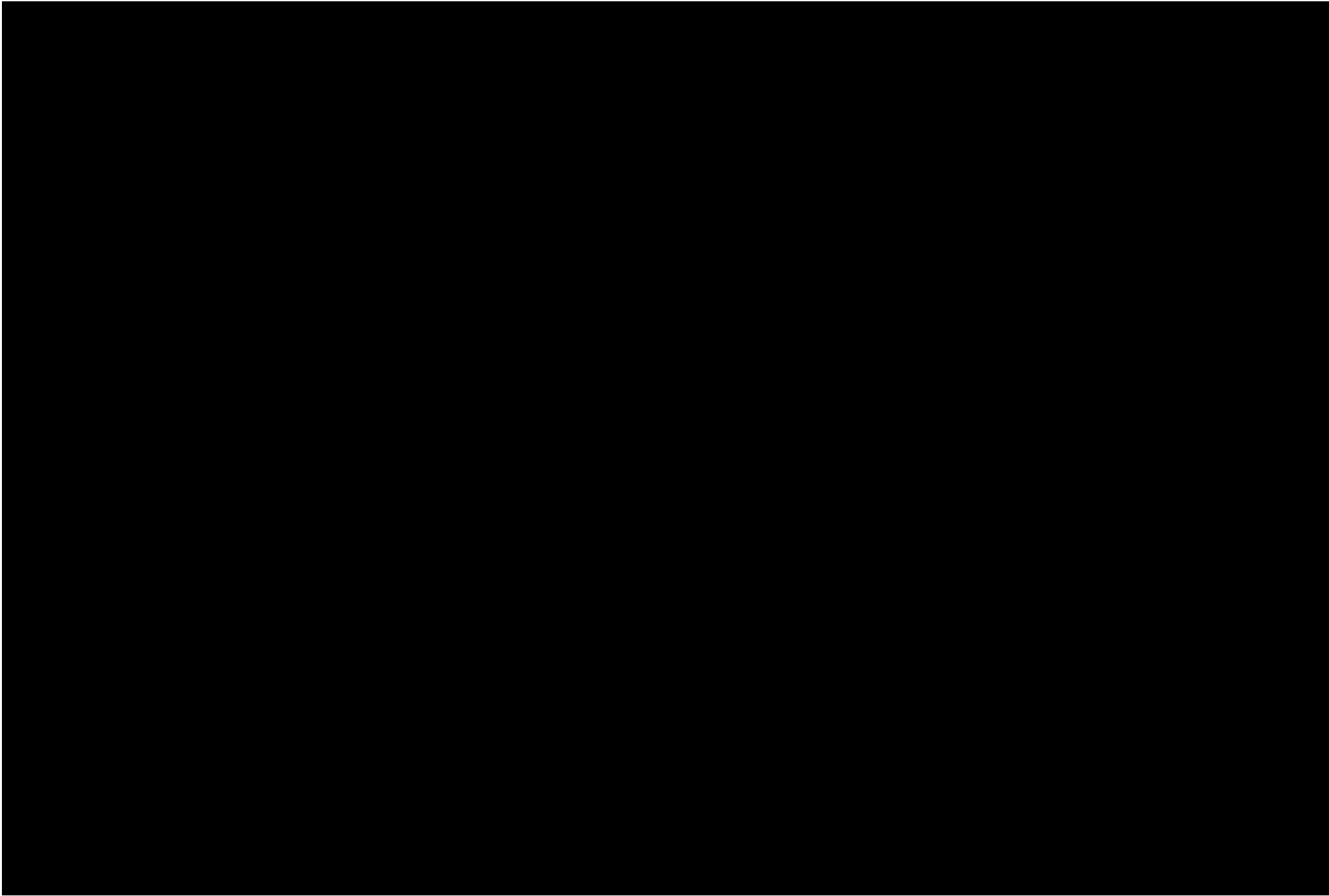


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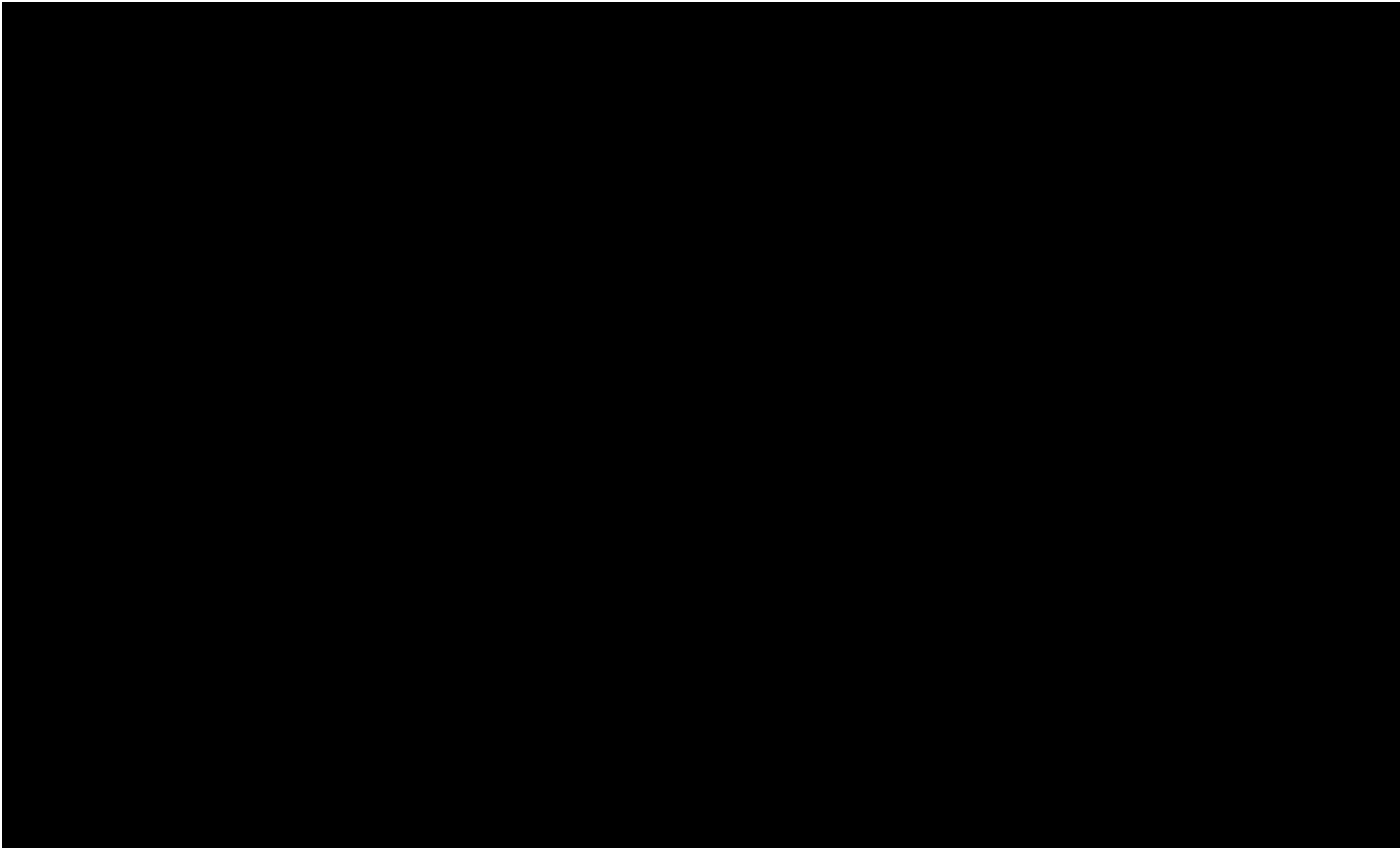




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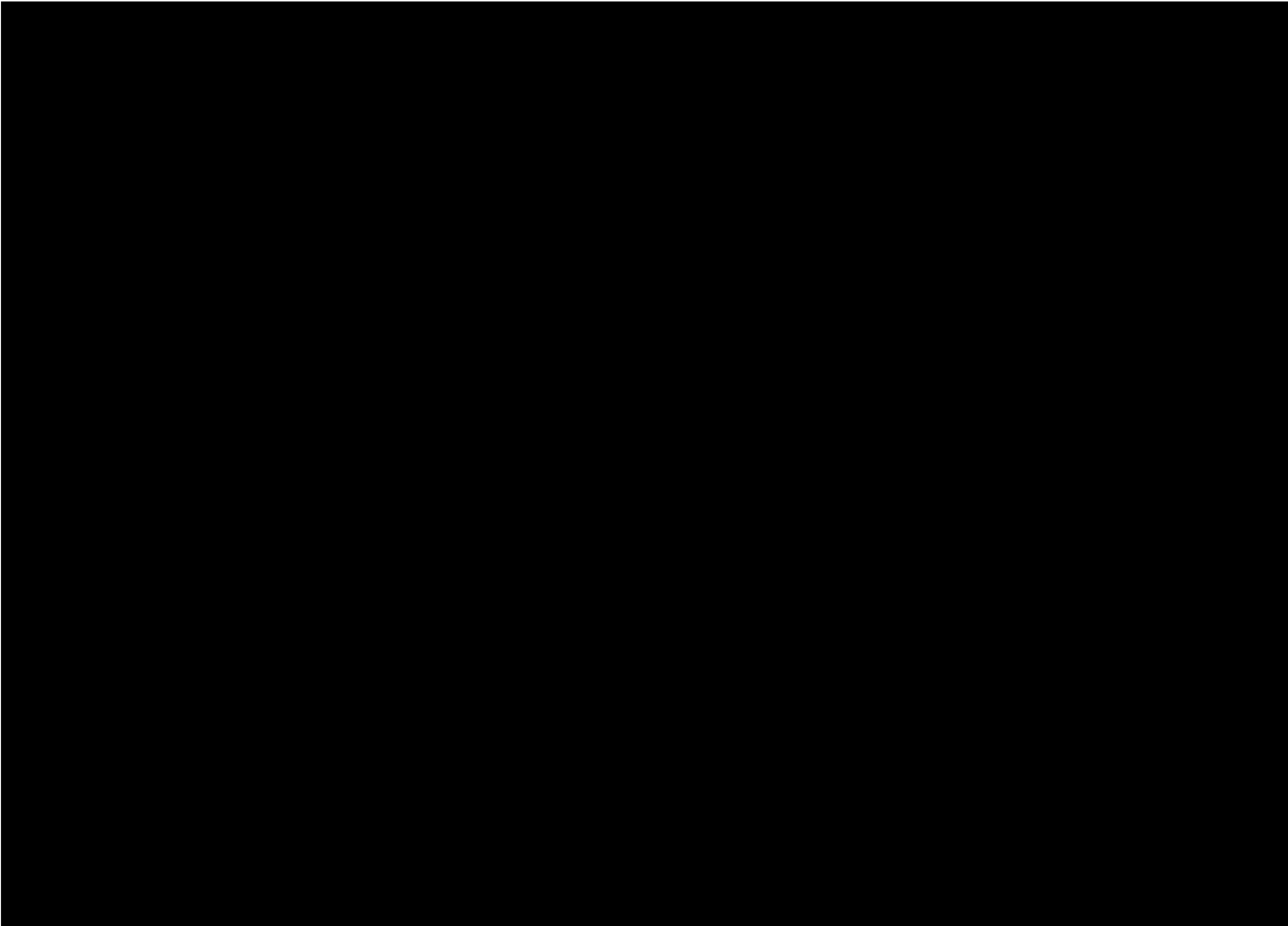


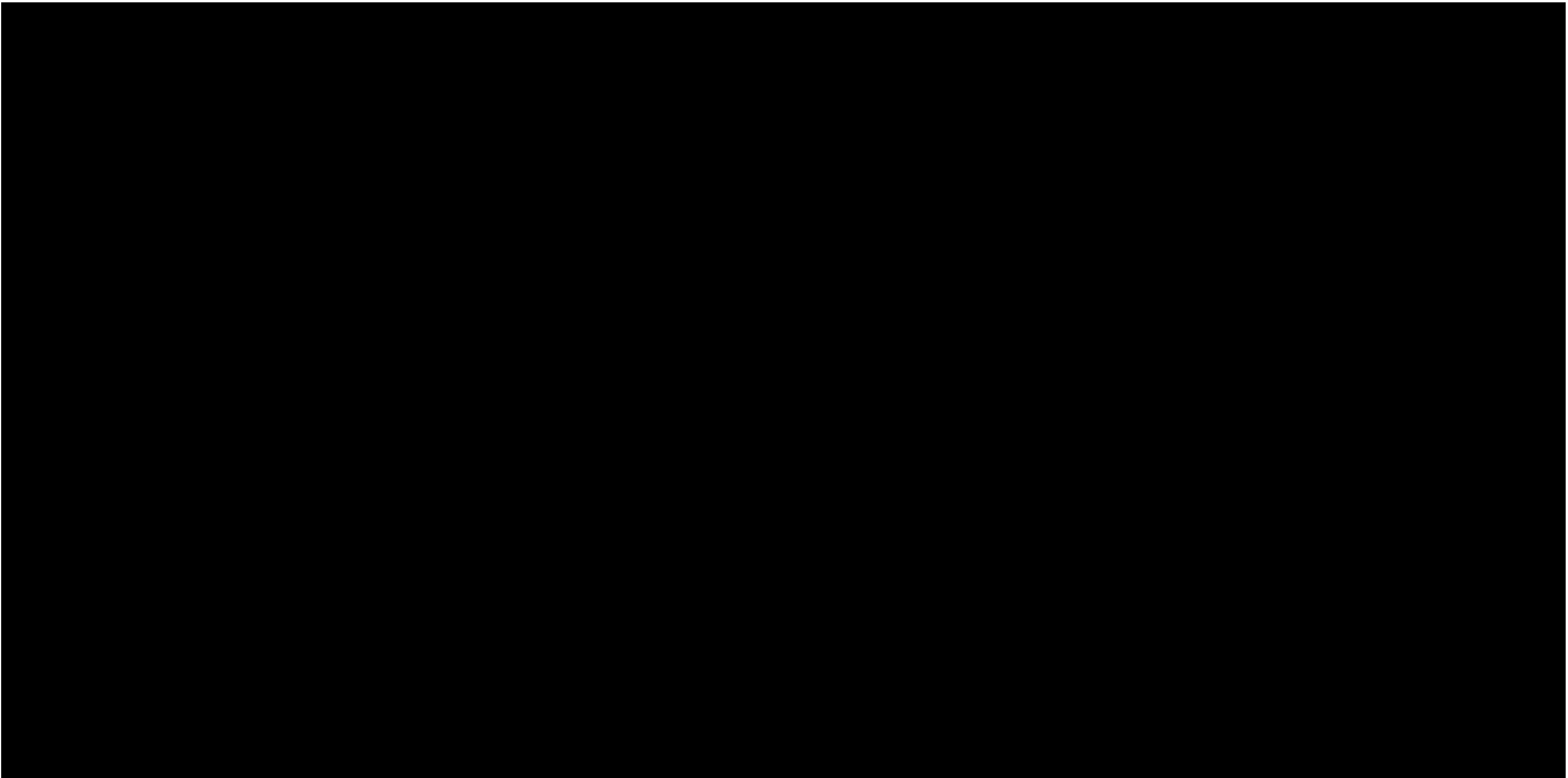
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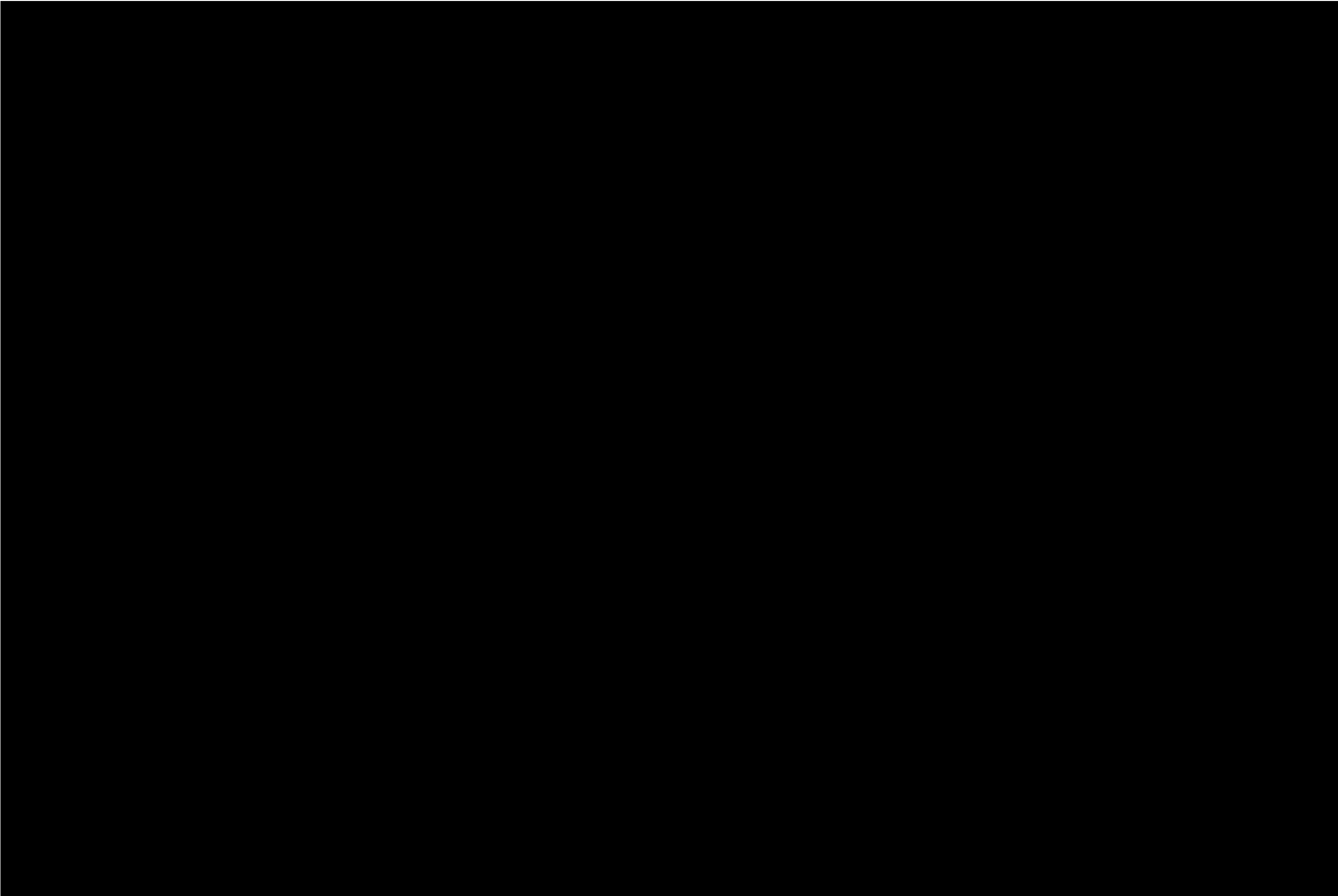
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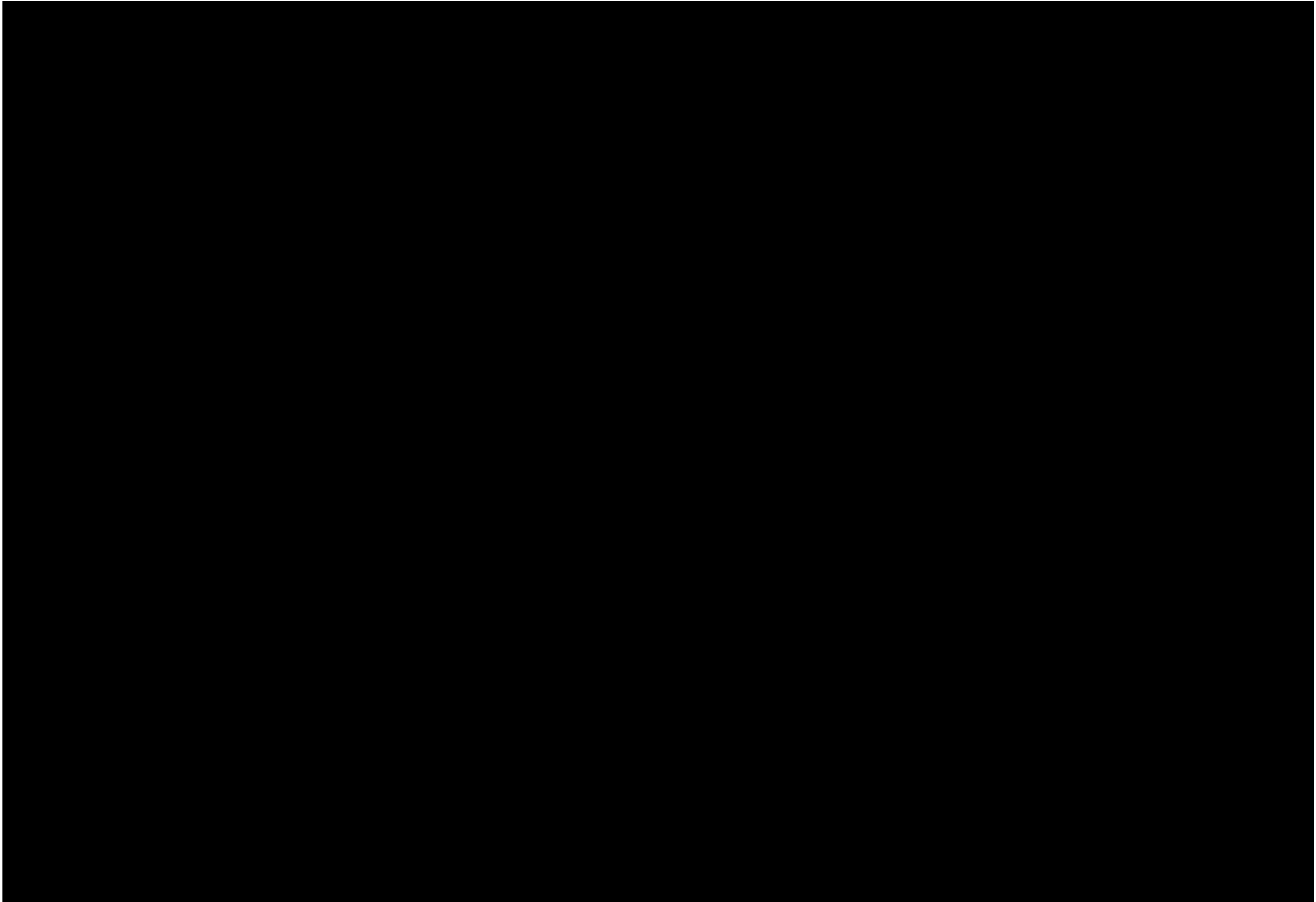


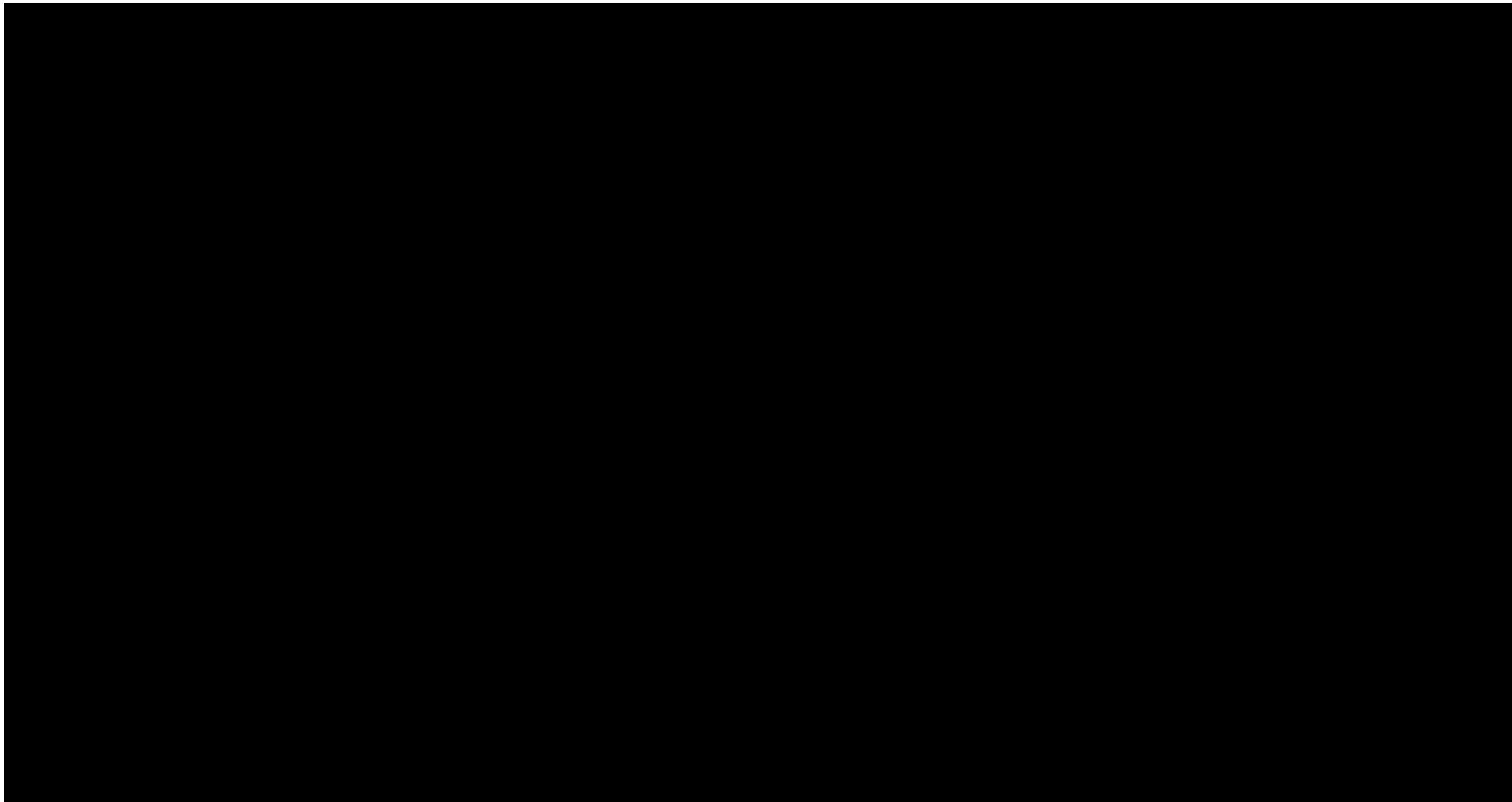


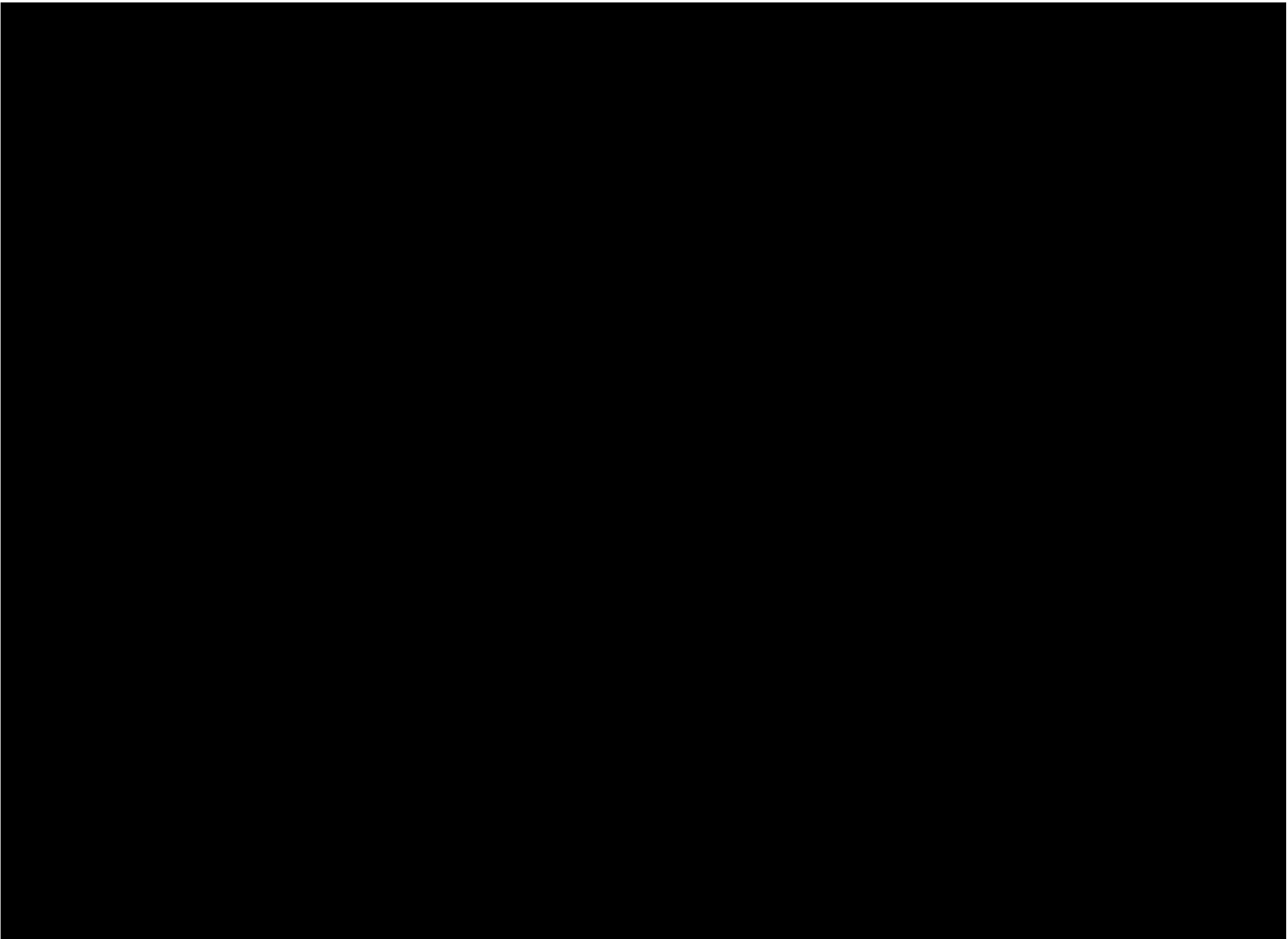
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