Nonlinear Regression: Some Ideas and a Little Guts
Breakout Session

My Name: ____________________________________

My Group: ____________________________________

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1. Explain *carefully* what `child45` is, what it contains, and why it had to be made.

2. Comment on the fitted nonlinear regression: How many iterations were required? Are all the parameters estimated to be (significantly) different from zero? Which parameter is most poorly estimated? Are there any problems analogous to collinearity in this fit?

3. If we had used the starting values `start=list(alpha=1, beta=1, gamma=1)`, the `nls()` function would have stopped with the message `Problem in nls(X1945 ~ alpha * exp( - gamma * exp( -..: singular gradient matrix`. What is going wrong?

4. The value for `sum(child45$X1945-mean(child45$X1945)^2)` is approximately 7529. Fill in the "?????" and the "??" in the line that calculates R^2, and then calculate R^2. Comment on this value.

5. Fill in the "??????" in the `lines()` command that makes the plot of the fitted Gompertz curve for the 145 birth cohort.

6. Do the plots look good? What kind of plot could you make, to explore whether there are other local minima besides the ones `nls()` found?

7. The logistic function for nonlinear regression is

$$f(x;\alpha.\beta,\gamma) = \frac{\alpha}{1+e^{-\beta(x-\gamma)}}$$

   (a) Do you expect the logistic fit to be better or worse than the Gompertz fit? Why or why not?

   (b) If you have time, write out the `nls()` command you would use to fit the logistic function to the 1945 data (including starting values, if you can). *Hint for starting values:*

$$\log\left(\frac{f(x)/\alpha}{1-f(x)/\alpha}\right) = \beta(x-\gamma)$$