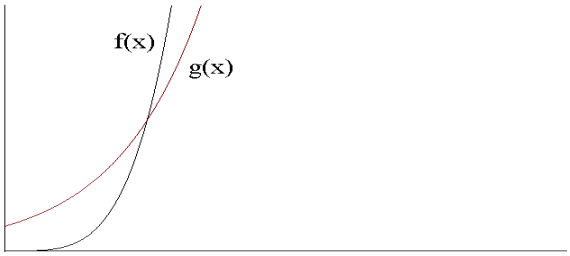
Lab Time: **Your Name:**

Task 1. Scaling the graph

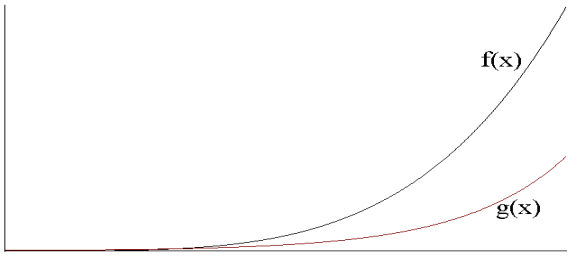
In your groups, use the TI-83 to graph $f(x) = x^4$ and $g(x) = 3^x$. Do not proceed until you are convinced that EVERYONE in your group can graph both of these functions on his or her calculator. Determine the appropriate domains and ranges in order to obtain the graphs below by adjusting the settings in WINDOW. The lower left corner of each graph is the origin, (0,0). Don't simply use trial and error to find the correct window domains and ranges. Think about what you are doing. For example, why is the y-intercept of $g(x)$ not showing in graph B?

Record the settings that give you each picture.

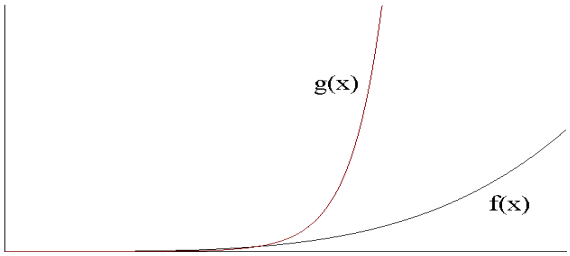
A.



B.



C.



Discussion

1. Discuss the difference and the apparent "contradiction" in the appearance of these graphs and carefully explain what accounts for the difference. (Don't just say "Different windows give different views." Explain in detail what's happening.)

2. In graph A, we see that $f(x)$ overtakes $g(x)$. Use the [TRACE] key on your graph to find (approximately) the x-value where this happens.

   Record this value: _____

   In graph C, $g(x)$ overtakes $f(x)$. So again there must be a point of intersection where this occurs. Adjust the domain and range of the graphing window on the TI-83 to find (approximately) the x-value where this happens.

   Record this value: _____

3. On the back of this page sketch a graph that clearly shows, with labels, all y-intercepts and points of intersection of f and g. Your graph will have to be not-to-scale if it is to fit on one sheet.

Task 2: Describing Graphs of Functions

For each of the following functions,

- find the range of the function and sketch a graph of it on the given domain,
- identify the function type, if possible: linear, polynomial, rational, logarithmic, exponential, trigonometric (or none of the above).
- indicate all the descriptive terms that apply to the function (or to specific pieces of the function): continuous, odd or even, increasing or decreasing, concave up or concave down, periodic, and whether it has any asymptotes.

First do as much as you can with the symbolic definition of the function, then graph it on the TI-83 to see if there are other descriptive terms that you can include.

1. $f(x) = 4x - 2$ where $x \in (-\infty, \infty)$.

2. $g(x) = e^{-x}$ where $x \in \mathbb{R}$.

3. $h(x) = |x|$ where $x \in \mathbb{Z}$.

   (To define the absolute value on the TI-83, press [MATH] [>] to obtain the Math Number options. Select `1:abs(` . Note that the graph of this function on the TI-83 will be for $x \in \mathbb{R}$.)

4. $j(x) = \begin{cases} 2 & -\infty < x <= -2 \\ x^2 + x & -2 < x <= 0 \\ \log_2(x) & 0 < x <= 2 \\ 1 & 2 < x < \infty \end{cases}$

(You can either graph this function by hand – i.e., without a calculator – or, to graph it on the TI-83, you can define four functions, graph all of them simultaneously, and then ignore the sections of the graphs that are not needed.)

5. $k(x) = 2\sin(x)$ where $-\infty < x < \infty$.

6. $l(x) = \dfrac{x}{x^2 + 1}$ where $x \in \mathbb{R}$.

7. $m(x) = \begin{cases} 1 & x \in [2n, 2n + 1) \\ -1 & x \in [2n + 1, 2n + 2) \end{cases}$ where $n = 0, \pm 1, \pm 2, \pm 3, \ldots$.