MAT 1340-G81, G82 Writing Project #2 Name____________________________________

50 Points

Graphing Functions by Transforming Basic Functions

Discussion

FORMATTING: This is semi-formal writing, here. That means show some professionalism. You don't have to type it out, but you do need to be very clear. See Course Schedule for due dates. There are 3: Early-Bird, On-Time, and Late.

SUBMISSIONS: Upload your PDF file (of several pages) to the drop box in the Assignments.

FORMATTING:

1. Work should be written on Plain white paper or electronic medium with a plain white background. There shouldn't be any rulings on the page. "College-ruled" paper is for high school. Standard letter-size pages.
2. Leave margins around the edges of your paper. ½-inch, all around, should do it.
3. To do this assignment properly, each problem should take up most or all of a page.
4. Do NOT try to squeeze things in! Be LAVISH in your use of space. Leave room for proper labels *and* your teacher's annotations.
5. Early Birds receive the best service. On-Time's didn't get as good of service as I wished. But most of the class were Early Birds, and I was POOPED on Monday and Tuesday!
6. I generally fit an average of 2 graphs, side by side. All of the problems require 5 graphs, except for a few at the end.

Main Resources: Chapter 2 Videos (and notes), Writing Project 2 Videos (and notes), and a selection of Old Writing Projects.

Students may use either of the following 2 methods. For full credit, I need to see 5 graphs for each problem, 1 point each. I expect to see you arrive at the graph of g by steps, applying each move, one at a time. There are 4 moves:

1. Replace y by ay: $af(x): y \to ay$
2. Replace x by bx: $f(bx): x \to \frac{1}{b}x$
3. Replace x by $x+c$: $f(x+c): x \to x-c$
4. Replace y by $y+d$: $f(x)+d : y \to y+d$

These 4 moves, in a proper sequence can get you from the graph of a basic function, $f(x)$, to the given function, $g(x) = af(bx+c)+d$

There are two generally accepts ways of going about stringing the moves together. The two methods are identical, except that steps 2 and 3 are executed in reverse order. The reason I like Method 2 so much is that's how you want to think about functions in Trig and Calculus. Factoring out the coefficient of x inside the function allows you to *see* the phase shift in a trig function, at a glance. So it's very good for your mathematical intuition. Method 1 avoids having to add fractions, which some college students fear. You need only use one method. I will display both in the solutions. An upwardly mobile student should be able to do both.

Method 1: This method does the horizontal shift before the horizontal stretch/shrink. Students seem to like it, but they will see more **Method 2** in their math futures.

$$0.\ f(x) \Rightarrow 1.\ 3f(x) \Rightarrow 2.\ 3f(x+2) \Rightarrow 3.\ 3f(5x+2) \Rightarrow 4.\ 3f(5x+2)+7 = g(x)$$

1. $(x,y)\mapsto(x,3y)$ 2. $(x,y)\mapsto(x-2,y)$ 3. $(x,y)\mapsto\left(\frac{1}{5}x,y\right)$ 4. $(x,y)\mapsto(x,y+7)$

Method 2: This method does the horizontal shrink/stretch before the horizontal shift.

0. $f(x)\Rightarrow$ 1. $3f(x)\Rightarrow$ 2. $3f(5x)\Rightarrow$ 3. $3f\left(5\left(x+\frac{2}{5}\right)\right)\Rightarrow$ 4. $3f\left(5\left(x+\frac{2}{5}\right)\right)+7=g(x)$

1. $(x,y)\mapsto(x,3y)$ 2. $(x,y)\mapsto\left(\frac{1}{5}x,y\right)$ 3. $(x,y)\mapsto\left(x-\frac{2}{5},y\right)$ 4. $(x,y)\mapsto(x,y+7)$

Problem Set

Graph the function $g(x)$ by transforming the graph of a basic function, $f(x)$. Start with a basic function graph, with at least 2 – and preferably 3 – points labeled. Then track where each of those points is moved to at each step. Using the same points I always use is usually the easiest, because THEY are the easiest ones to obtain in your basic function graph that is always the first graph in these sequences.

1. $g(x)=\frac{2}{5x+15}+7$ (Use $(1,1)$, and $(-1,-1)$ as the 3 (x,y)'s in the 1st graph.) This graph has 2 asymptotes.

2. $g(x)=5(7x+21)^{2/3}-8$ (Use $(0,0),(1,1)$, and $(8,4)$ as the 3 points in the 1st graph.)

3. $g(x)=\frac{7}{(9x+18)^3}-5$ (Asymptotes!)

4. $g(x)=-5\sqrt[3]{11x-55}+7$

5. $g(x)=6\sqrt[4]{2x+14}+11$

6. $g(x)=5(6x-42)^3+8$

We treat lines and parabolas a little differently. They come up so often - plus the completing-the-square trick – we sidestep the whole $f(bx)$ issue and just work with $g(x)=a(x-h)^2+k$ and $g(x)=m(x-h)+k=m(x-x_1)+y_1$.

7. $g(x)=-7(x+2)+5$

8. $g(x)=-7(x+2)^2+5$

9. $g(x)=x^2-6x-8$

10. $g(x)=2x^2-4x+20$

Completing-the-Square Cheat:

$$g(x)=ax^2+bx+c=a(x-h)^2+k=a\left(x-\frac{-b}{2a}\right)^2+g\left(-\frac{b}{2a}\right)$$