MAT 121-G11 Makeup Test 4 – Fall, 2017 (5 pts) Name_____
100 Points Covers Chapter 4 NO GRAPHING CALCULATORS!!!

Do your own work on separate paper. Leave plenty of margin and plenty of room around your work. I'm not impressed if you squeeze more work into a smaller space. To the contrary. At the end, please make sure your problems are in order. I'm too old and ornery to want to go on a scavenger hunt to award you points.

1. (20 pts) Starting with $f(x)=3^x$, sketch the graph of $g(x)=-2\cdot 3^{6x+18}+4$ in 5 steps (counting $f(x)=3^x$ as the first step). Use $x=-1, x=0,$ and $x=1$ to find 3 points in the first graph, and show how these 3 points are moved around by each step in the transformation to $g(x)$.

2. (10 pts) Find the *exact* *x*- and *y*-intercepts for $f(x)$ from #1.

3. Let $f(x)=\sqrt{x-6}$ and $g(x)=x^2+x-6$.
   a. (5 pts) What is the domain of f ?
   b. (5 pts) What is the domain of g ?
   c. (5 pts) Determine $\left(\frac{g}{f}\right)(x)$. (Sometimes just called "$\frac{g}{f}$" in the text.). Do not simplify.
   d. (5 pts) What is the domain of $\left(\frac{g}{f}\right)(x)$?
   e. (5 pts) Determine $(f\circ g)(x)$ (Again, sometimes just called $f\circ g$)

4. (5 pts) What is the domain of $\sqrt{\frac{(x-3)(x+5)^3}{(x-4)^2}}$?

5. (5 pts) What is the domain of $\ln\left(\frac{(x-3)(x+5)^3}{(x-4)^2}\right)$?

6. (10 pts) Let $f(x)=2^{5x-2}-8$. Find $f^{-1}(x)$.

7. (10 pts) Solve $\ln(x-3)+\ln(x+2)=\ln(2x+4)$.

8. Suppose the half-life of C-14 is 5500 years. (It isn't, quite, but just suppose…).
   a. (10 pts) Derive the exponential decay model, $A(t)=A_0e^{kt}$. The trick is to use the half-life to find the relative decay rate, *k*.
   b. (5 pts) How old is a sample of charcoal from a prehistoric fire pit, if 37% of the C-14 has decayed (i.e., 63% is left.) ? Round to the nearest year in your final answer.

Bonus Answer up to three (3) 5-pointers. That's a total of 15 bonus points possible.

B 1 (5 pts) Solve the absolute value inequality: $|-5x+8|-11>-2$

B 2 (5 pts) Re-write $f(x)=5x^2-3x+1$ in the form $a(x-h)^2+k$.

B 3 (5 pts) Solve the exponential equation $3\cdot(7.7)^x=11\cdot(2.1)^x$

B 4 John can finish a job in 6 hours that it takes Bill 11 hours to finish. Suppose Bill shows up and starts working 2 hours before John shows up, and then they work together until the job is done. How many hours does each of the two end up working?

B 5 Find the geometric sums:

a) (5 pts) $1+49+343++.....+5{,}764{,}801$

b) (5 pts) $\sum_{n=1}^{\infty}5\cdot\left(\frac{2}{7}\right)^{n-1}$

B 6 (5 pts) Prove that $\sum_{k=1}^{n}a\cdot r^{k-1}=a\left(\frac{1-r^n}{1-r}\right)$

B 7 What's the domain of $(f\circ g)(x)$ from problem #2e, above?