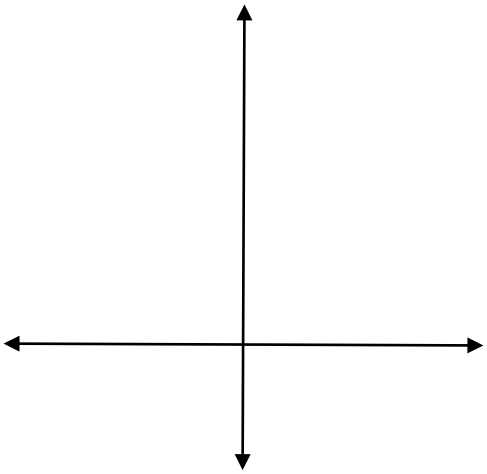
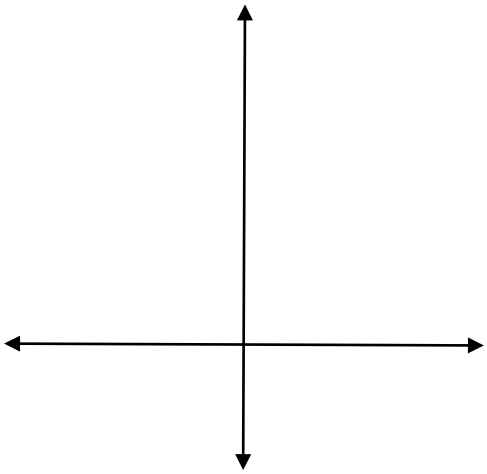
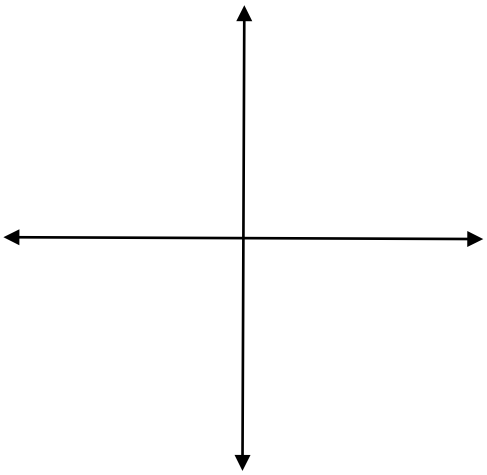
MAT 121-G81 Test 4 – Fall, 2012 Name_____

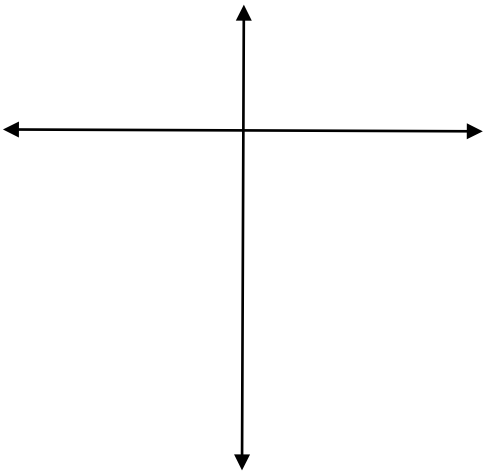
100 Points Covers Chapter 4, plus 7.1, 7.3 NO GRAPHING CALCULATOR!!!

1. (15 pts) Starting with $f(x) = 5^x$, sketch the graph of $g(x) = -3 \cdot 5^{x+1} + 2$ in 4 steps (counting $f(x) = 5^x$ 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 $g(x)$. Your final graph should also show the y-intercept and, *for 5 bonus points*, the x-intercept.









2. For $f(x) = \sqrt{x+6}$ and $g(x) = x^2 - 2x + 2$, determine...:

a. (10 pts) ... the composite function $(f \circ g)(x)$

b. (10 pts) ... the *domain* of the composite function $(f \circ g)(x)$

3. (10 pts) What is the domain of $g(x) = \ln(x+6)$?

4. (5 pts) What is the domain of $\sqrt{\dfrac{(x+5)^2}{(x-4)(x-1)^3}}$? (This is like a Chapter 3 question!)

5. (5 pts) Find functions *f* and *g* so that $f \circ g = H$, given that $H(x) = \log_5\left(x^2 - 4\right)$.

6. (5 pts) Let $f(x) = \log_5(2x+7) - 4$. Find $f^{-1}(x)$.

7. (10 pts) Solve *without a calculator*: $2^{x+3} = 5^{x-4}$. All I want is a symbolic answer and the symbolic manipulations you perform to *get* there. For full credit, your answer should involve a logarithm or two in it.

8. Find the geometric sums:

a. (5 pts) $10 - 2 + \frac{2}{5} - \frac{2}{25} + ... + \frac{2}{78125}$ (Be careful finding your a, r, and n in $a \cdot r^{n-1}$)

b. (5 pts) $\sum_{k=1}^{\infty} 10 \cdot \left(\frac{1}{5}\right)^{k-1}$

9. (10 pts) Solve: $\log_5(x-4)+\log_5(x+2)=\log_5(7)$ for x.

10. The half-life of radioactive Millsium is 250 years.

a. (5 pts) Derive the exponential decay model $A(t) = A_0e^{kt}$. The trick, here, is to find the relative growth rate, k, based on the doubling time given.

b. (5 pts) How old is a sample of Millsium if only 1/3 of the radioactive isotope remains ?