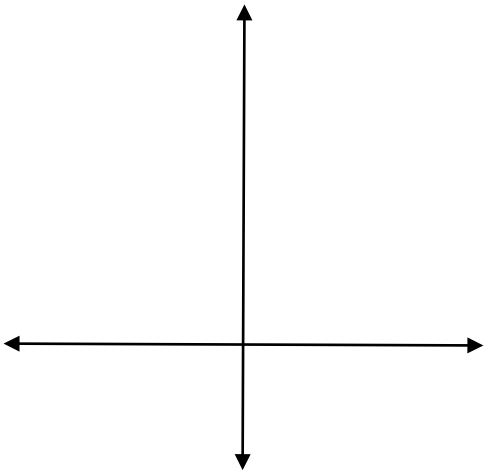
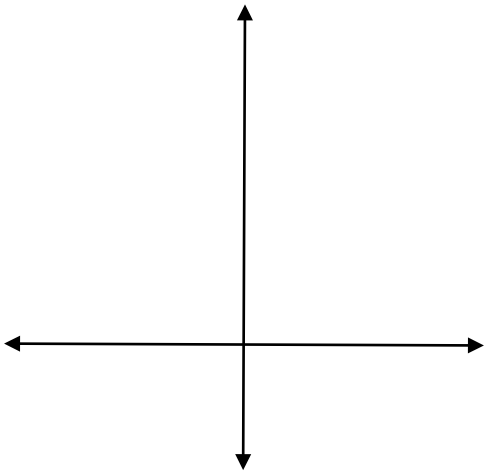
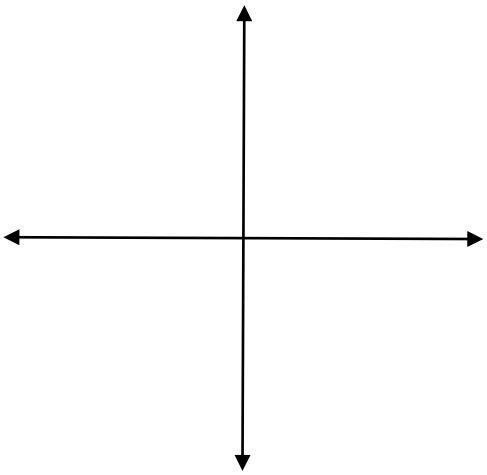
MAT 121-G81 Test 4 – Fall, 2011 Name_____

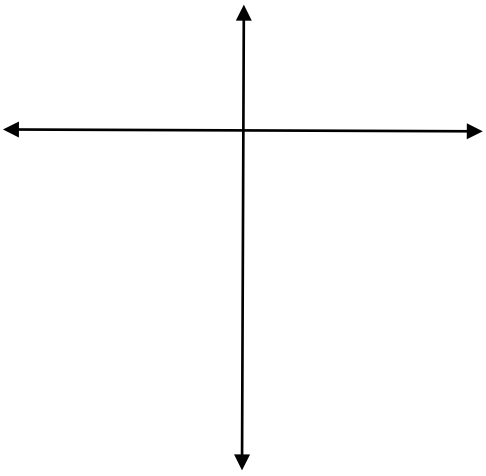
100 Points Covers Chapter 4, plus 7.1, 7.3 NO GRAPHING CALCULATOR!!!

1. (20 pts) Starting with $f(x) = 3^x$, sketch the graph of $g(x) = 7 \cdot 3^{x-1} - 2$ in 4 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 $g(x)$. Your final graph should also show the y-intercept and, for 5 bonus points, the x-intercept.





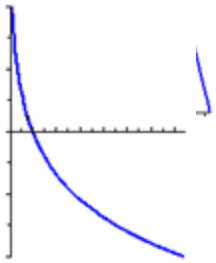




2. (10 pts) Determine which of the following are functions and whether they are one-to-one. So indicate by writing "Yes" or "No" in the appropriate spaces.

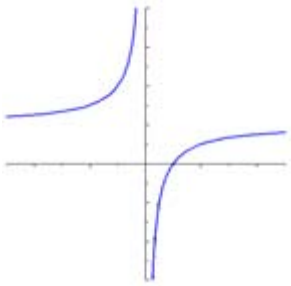
Function?

1-to-1?



Function?

1-to-1?



Function?

1-to-1?

Function?

1-to-1?

3. For $f(x) = \sqrt{2x+1}$ and $g(x) = \frac{1}{x}$, determine the following composite functions, *simplify them*, and state their domains:

a. (5 pts) $(f \circ g)(x)$

b. (5 pts) $(g \circ f)(x)$

4. (5 pts) What is the domain of $g(x) = \ln(x+7)$?

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

6. (5 pts) Find functions *f* and *g* so that $f \circ g = H$, given that $H(x) = e^{2x-5}$.

7. (5 pts) Let $f(x) = \log_7(x+2)+3$. Find $f^{-1}(x)$.

8. (10 pts) Solve *without a calculator*: $e^{x-7} = 4^{2x+1}$. 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.

9. Find the geometric sums:

a. (5 pts) $4-2+1-\frac{1}{2}+...+\frac{1}{64}$ (Be careful finding your a, r, and n in $a\cdot r^{n-1}$)

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

10. (10 pts) Solve: $\ln(x-4)+\ln(x+1)=\ln(6)$ for x.

11. The doubling time of a rabbit population in a study is 10 years. Assume the population obeys the law of uninhibited growth, that is, assume that growth is exponential.

a. (5 pts) Derive the exponential growth model $A(t) = A_0 e^{kt}$. The trick, here, is to find the relative growth rate, k, based on the doubling time given.

b. (5 pts) Suppose the rabbit population was 500 at the beginning of the study, and it was 6,000 in 1998. When did the study begin?