MAT 121-G81   Test 4 – Spring, 2013   (5 pts) Name_____

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

1. (20 pts) Starting with $f(x)=5^x$, sketch the graph of $g(x)=4\cdot 5^{x+1}-3$ 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.
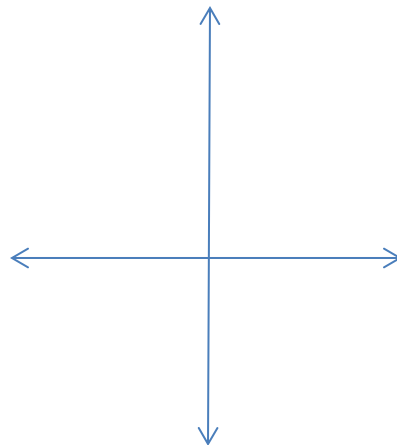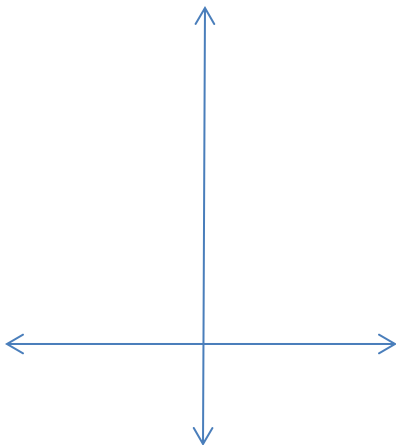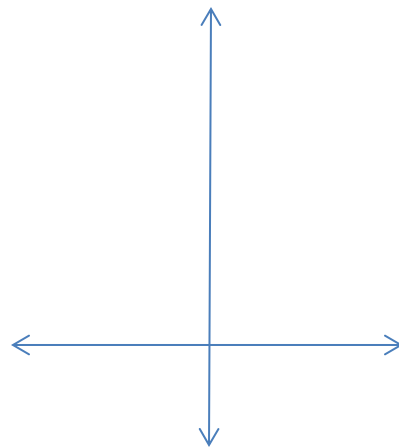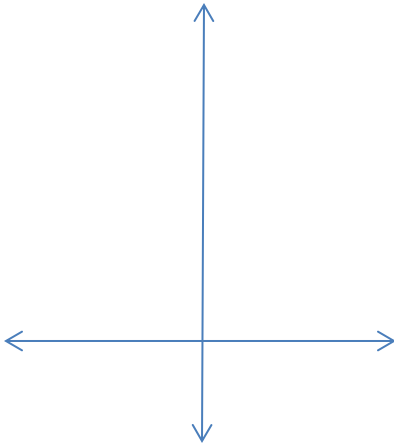
2. Let $f(x) = \sqrt{2x+1}$ and $g(x) = \dfrac{1}{x-2}$.

   a. (8 pts) What is the domain of f ?

   b. (7 pts) What is the domain of g ?

   c. Determine the following composite functions. You don't need to simplify. In fact, I recommend you do not.

      i) (5 pts) $(f \circ g)(x)$

      ii) (5 pts) $(g \circ f)(x)$

   d. (5 pts) What is the domain of $(f \circ g)(x)$? (Now, you should simplify $(f \circ g)(x)$)

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

4. (5 pts) Find functions f and g so that $f \circ g = H$, given that $H(x) = \ln(x^2 - 3x + 2)$

5. (5 pts) Let $f(x) = e^{2x-5} - 7$. Find $f^{-1}(x)$.

6. Find the geometric sums:

   a. (5 pts) $3-6+12-24+......+192$

   b. (5 pts) $\displaystyle\sum_{n=1}^{\infty}\left(\frac{1}{3}\right)^{n-1}$

7. (5 pts) Solve $\ln(x+1)+\ln(x-4)=\ln(6)$.

8. Suppose the half-life of C-14 is 7,000 years. (It isn't, quite, but just suppose…).

    a. (10 pts) Derive the exponential decay model, $A(t) = A_0 e^{kt}$. The trick is to use the half-life to find the relative decay rate, k.

    b. (5 pts) How long would it take 100 grams of C-14 to decay to 27 grams (assuming the half-life is as above).