MAT 121-G11   Test 4 – Spring, 2014   (5 pts) Name_____

100 Points   Covers Chapter 4, plus 8.3   NO GRAPHING CALCULATORS!!!

1. (20 pts) Starting with $f(x) = 3^x$, sketch the graph of $g(x) = 2 \cdot 5^{x+4} - 3$ 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. Let $f(x) = \sqrt{2x+8}$ and $g(x) = \dfrac{1}{x+2}$.

   a. (5 pts) What is the domain of f ?   b. (5 pts) What is the domain of g ?

   c. (5 pts) Determine $(f+g)(x)$. (Sometimes just called " $f+g$ " in the text.). Do not simplify.

   d. (5 pts) What is the domain of $(f+g)(x)$?

   e. (5 pts) Determine $(f \circ g)(x)$ (Again, sometimes just called $f \circ g$)

   f. (5 pts) What is the domain of $(f \circ g)(x)$? Hint: An interval of length ½.

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

4. (5 pts) Let $f(x)=5^{2x-5}-3$. Find $f^{-1}(x)$.

5. Find the geometric sums:

   a. (10 pts) $1+3+9+27+......+19683$

   b. (5 pts) $\displaystyle\sum_{n=1}^{\infty} 2 \cdot \left(\frac{2}{3}\right)^{n-1}$

6. (5 pts) Solve $\log_2(x-4)+\log_2(x+3)=3$.

7. Suppose the half-life of C-14 is 5900 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 old is a sample of charcoal from a prehistoric fire pit, if 43% of the C-14 has decayed (i.e., 35% is left.) ? Round to the nearest year in your final answer.