100 Points

Covers Chapter 4, plus 8.3

NO GRAPHING CALCULATORS!!!

1. (20 pts) Starting with $f(x) = 3^x$, sketch the graph of $g(x) = -5 \cdot 3^{x-6} + 7$ 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 $f(x) = \sqrt{3x-9}$ and $g(x) = \frac{1}{x-5}$.
 - 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 $(f \circ g)(x)$. Hint: The final domain is an interval of length $\frac{1}{2}$. Very small domain.

3. (5 pts) What is the domain of $\sqrt{\frac{(x-5)(x+2)^3}{(x-8)^2}}$?

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

5. Find the geometric sums:

a.
$$(10 \text{ pts})$$
 $5+10+20+40+.....+320$

b. (5 pts)
$$\sum_{n=1}^{\infty} 3 \cdot \left(\frac{5}{7}\right)^{n-1}$$

6. (5 pts) Solve $\log_2(x+14) + \log_2(x+18) = 5$.

- 7. Suppose the half-life of C-14 is 5200 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 65% of the C-14 has decayed (i.e., 35% is left.)?