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 $f(x)=\sqrt{3 x-9}$ 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) $(5 \mathrm{pts})(f \circ g)(x)$
ii) $(5 \mathrm{pts})(g \circ f)(x)$
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 $1 / 2$. 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 $f(x)=5^{2 x-5}-3$. Find $f^{-1}(x)$.
5. Find the geometric sums:
a. (10 pts) $5+10+20+40+\ldots \ldots+320$
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 $\mathrm{C}-14$ is 5200 years. (It isn't, quite, but just suppose...).
a. (10 pts) Derive the exponential decay model, $A(t)=A_{0} e^{k t}$. 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.)?
