1. (20 pts) Starting with $f(x) = 4^x$, sketch the graph of $g(x) = 2 \cdot 4^{x-3} - 9$ in 4 steps (counting $f(x) = 4^x$ 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 $g(x)$. Finding the x- and y-intercepts is a separate problem, so don't worry about them, on this page.

2. Let $f(x) = \sqrt{2x+4}$ and $g(x) = \dfrac{x-2}{x-7}$.

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

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

    c. (5 pts) Write the function $\dfrac{f}{g}$. Do not simplify.

    d. (5 pts) Write the function $f \circ g$. Do not simplify.

    e. (10 pts) What is the domain of $\dfrac{f}{g}$?

3. (10 pts) Let $g(x) = 2 \cdot 4^{x-3} - 9$. Find the x- and y-intercepts for this function, rounded to 4 decimal places. For 5 **bonus** points, label these intercepts on your final graph on page 1.

4. Find the domain:

   a. (5 pts) $\sqrt{\dfrac{(x-2)(x+3)^2}{(x-7)^4(x+5)}}$. (Sign Pattern!)

   b. (5 pts) $\log_3\left(\dfrac{(x-2)(x+3)^2}{(x-7)^4(x+5)}\right)$ (Reinterpret previous sign pattern in the current context!)

5. (10 pts) Solve $\log_7(x-4) + \log_7(x+2) = 1$.

6. (10 pts) Solve $2^{x^2-8} \cdot 2^{-3x} = 4$.

7. (10 pts) The half-life of a radioactive isotope is 700 years. Find how old a sample is, if 95% of the isotope in an ancient manuscript has decayed (i.e., if only 5% of the radioactive isotope remains.). Give this answer to the nearest year.

8. (10 pts) Solve the equation $5 \cdot (1.08)^x = 2^x$. Give an exact answer and a decimal answer, rounded to 4 places.

Solve any two (2) Bonus problems for up to 10 points. I'll grade the first two I come to.

1. BONUS (5 pts) Solve the absolute value inequality $|2x - 7| \geq 8$

2. **BONUS** (5 pts) Find the inverse function for $f(x) = \sqrt{2x - 6} + 1$. Then

state the domain and range for both f and f^{-1}.

3. BONUS (5 pts) Re-write the function $g(x) = 5x^2 + 10x - 19$ in the

form $g(x) = a(x - h)^2 + k$. State the vertex of this parabola.

This is the picture for **Bonus #4**

4. BONUS (5 pts) Write the formula for the piecewise-defined function shown, above right.

5. Bonus (5 pts) Find the domain of the composite function $f \circ g$, from Page 2.