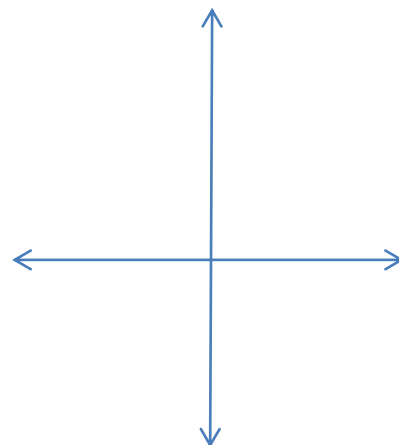
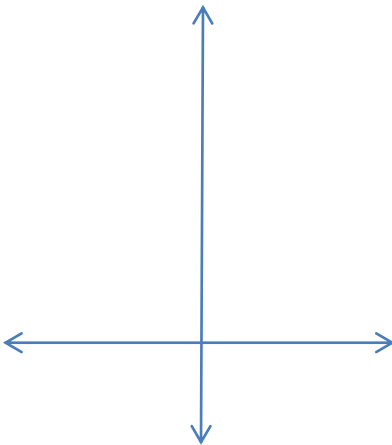
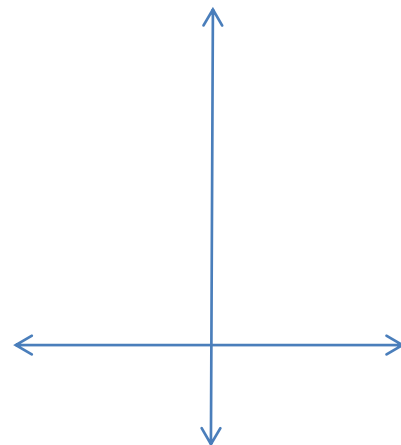
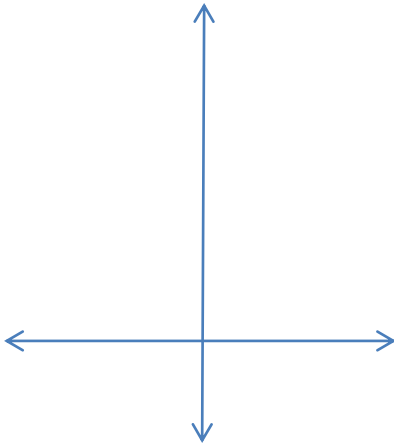


1. (20 pts) Starting with  $f(x) = 2^x$ , sketch the graph of  $g(x) = 3 \cdot 2^{x-4} - 7$  in 4 steps (counting  $f(x) = 2^x$  as the first step). Use  $x = -1$ ,  $x = 0$ , and  $x = 1$  to find 3 points in the first graph, and show how these 3 points are moved around by each step in the transformation to  $g(x)$ . Your final graph should also show the  $y$ -intercept and, for 5 bonus points, the  $x$ -intercept.



2. Let  $f(x) = \sqrt{2x-4}$  and  $g(x) = \frac{1}{x-5}$ .
- (8 pts) What is the domain of  $f$  ?
  - (7 pts) What is the domain of  $g$  ?
  - Determine the following composite functions. You don't need to simplify. In fact, I recommend you do not.
    - (5 pts)  $(f \circ g)(x)$
    - (5 pts)  $(g \circ f)(x)$
  - (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  $\sqrt{\frac{(x-3)(x+3)^2}{(x-8)}}$  ?

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

5. Find the geometric sums:

a. (10 pts)  $5 + 10 + 20 + 40 + \dots + 320$

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

6. (5 pts) Solve  $\log(x) + \log(x + 48) = 2$ .

7. Suppose the half-life of C-14 is 5800 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 80% of the C-14 has decayed (i.e., 20% is left.) ?