Worksheet 1

1. Find the domain of the following functions:

$$f(x) = \frac{1}{x-3} \qquad g(x) = \frac{1}{\sqrt{x-3}} \qquad h(x) = \frac{1}{\sqrt{x^2-3}}.$$

2. Consider the function

$$f(x) = \begin{cases} 2 & \text{if } x < -3 \\ 2x+5 & \text{if } -3 < x < 2 \\ -0.25x^2 + 10 & \text{if } x \geq 2 \end{cases}$$

Graph $y = f(x)$ and write the domain of $f(x)$ using both inequality notation and interval notation. Finally, find the range of $f(x)$ by examining the graph you drew.

3. What is the function

$$f(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$

better known as? Graph $y = f(x)$ and find the domain and range of this function. Does this function have an inverse f^{-1} whose domain is the range of f? If not, what is happening that prevents the inverse from existing?

4. Find the inverse of $f(x) = x^3 + 1$. Find $f^{-1}(10)$ and $f^{-1}(-10)$. What are the domain and range of f? f^{-1}?

5. Evaluate $\cos(\pi/12)$ using the formula $\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$.

6. Use the half-angle formula to evaluate $\cos^2(\pi/8)$.

7. Suppose $\sin(x) = 3/5$ and $x \in [\frac{-\pi}{2}, 0]$. Find $\cos(x)$ and $\tan(x)$.

8. Suppose f and g are functions such that

$$\begin{array}{ll} f(0) = 1 & g(0) = 2 \\ f(1) = 3 & g(1) = 0 \\ f(2) = 4 & g(3) = \text{-}2 \end{array}$$

Find $f \circ g(0)$ and $g \circ f(0)$.