Worksheet 1

1. Find the domain of the following functions:
   
   \[ f(x) = \frac{1}{x - 3} \quad g(x) = \frac{1}{\sqrt{x - 3}} \quad h(x) = \frac{1}{\sqrt{x^2 - 3}} \]

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 \( x \in [\pi/2, 0] \). Find \( \cos(x) \) and \( \tan(x) \).

8. Suppose \( f \) and \( g \) are functions such that

\[
\begin{align*}
  f(0) &= 1 & g(0) &= 2 \\
  f(1) &= 3 & g(1) &= 0 \\
  f(2) &= 4 & g(3) &= -2
\end{align*}
\]

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