NAME: Solutions
Math 21F Quiz I September 2, 2014
As always, show your method for solving each problem

1. The graph of the function \( f(x) \) is shown below.

![Graph of \( f(x) \) with points labeled on the axes.]

a. What is the domain of \( f(x) \)? Write it in interval notation.
   \[ [0, 2] \cup [3, 4] \]

b. What is the range of \( f(x) \)? Write it in interval notation.
   \[ [-1, 0] \cup (1, 2] \]

c. Write out the definition of \( f(x) \) in standard notation.

\[
f(x) = \begin{cases} 
-x & 0 \leq x \leq 1 \\
2 & 3 \leq x \leq 4 \\
x & 1 < x < 2 
\end{cases}
\]

a. Is the function \( g(x) = \frac{x \sin(x)}{x^2 + 4} \) even, odd, or neither? Explain how you can tell.

\[
g(-x) = \frac{-x \sin(-x)}{(-x)^2 + 4} = (-x)(-\sin(x)) = \frac{x \sin(x)}{x^2 + 4} = g(x)
\]

\( g(-x) = g(x) \) so \( g \) is even.

b. Give an example of a polynomial function that is neither even nor odd.

\( 1 + x \) or \( x + x^2 \), many examples involving at least one odd exponent and one even exponent (such as \( x^0 \)).
3. Does the graph of \( y = -3x^5 + 20008x^2 - 4 \) rise or fall to the right for large positive values of \( x \)? Explain.

It \( \text{falls} \) because the lead term \(-3x^5\) has a negative coefficient.

4. a. Draw the angle \( 210^\circ \) in standard position.

   \[ \begin{aligned}
   210^\circ & = 180^\circ + 30^\circ = \pi + \frac{\pi}{6} = \frac{7\pi}{6} \text{ radians} \\
   \text{or} \quad 210^\circ \times \frac{\pi}{180} & = \frac{4\pi}{3} = \frac{7\pi}{6} \text{ radians}
   \end{aligned} \]

5. Suppose that \( \theta \) is an angle in the second quadrant and \( \sin(\theta) = \frac{12}{13} \).

   a. Find the value of \( \cos(\theta) \).

   \[ \sqrt{13^2 - 12^2} = \sqrt{169 - 144} = \sqrt{25} = 5. \] We see \( x = -5 \) in second quadrant.

   \[ \cos(\theta) = \frac{x}{r} = \frac{-5}{13} \]

   b. Find the value of \( \tan(\theta) \).

   \[ \tan \theta = \frac{y}{x} = \frac{12}{-5} = -\frac{12}{5} \]

   \[ \tan^2 \theta = 5 \]

   \[ \frac{\sin^2 \theta}{\cos^2 \theta} = \frac{25}{169} \]

   \[ \cos(\theta) = \frac{-5}{13} \]

   \[ \tan(\theta) = \frac{12}{-5} = -\frac{12}{5} \]

   \[ \cos(\theta) = \frac{-5}{13} \]