Worksheet #5, September 8, 2015
Math 221 Lecture EL1

Instructions. Put your first and last name at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning. All worksheets from each group will be collected.

1. Calculate \( \lim_{x \to \infty} \frac{t - t\sqrt{t}}{2t^{3/2} + 3t - 5} \)

   Answer: \(-\frac{1}{2}\).

2. Calculate \( \lim_{x \to -\infty} (x + \sqrt{x^2 + 2x}) \)

   Answer: \(-1\)

3. Find the horizontal and vertical asymptotes of the function \( f(x) = \frac{1 + x^4}{x^2 - x^4} \)

   Answer: The horizontal asymptote is given by \( y = -1 \) (Note that \( \lim_{x \to \infty} f(x) = \lim_{x \to -\infty} f(x) = -1 \); hence there is only one horizontal asymptote. The vertical asymptotes are given by \( x = 1 \) and \( x = -1 \).

4. Use the limit definition of a derivative to find the equation of the tangent line to the curve \( y = x^3 - 3x + 1 \) at the point \((2, 3)\). Give your answer in \( y = mx + b \) form.

   Answer: The tangent line to this curve at \((2, 3)\) is given by \( y = 9x - 15 \).

5. The limit \( \lim_{x \to \pi/4} \frac{\tan(x) - 1}{x - \pi/4} \) represents the derivative of some function \( f \) and some number \( a \), given by the limit definition. State such an \( f \) and \( a \) in each case.

   Answer: \( f = \tan(x) \), and \( a = \pi/4 \).