Written Homework

Your carefully written solutions to the following questions will be due at the beginning of class on Monday, February 2.

1. For each of the functions below, determine the intervals where the function is increasing.
   (a) \((x^2 + 2x + 1)e^x\)
   (b) \(\frac{x}{x^2 + 1}\)
   (c) \(\frac{xe^x}{x + 2}\)

2. Find the x-coordinates of all the points on the parabola \(y = x^2\) where the tangent lines pass through the point \((1, -3)\).

3. The line \(2x - y = b\) is tangent to the parabola \(y = ax^2\) at the point where \(x = 2\). Find \(a\) and \(b\).

4. Find a cubic function \(y = ax^3 + bx^2 + cx + d\) whose graph has horizontal tangents at the points \((-2, 6)\) and \((2, 0)\).

5. How many tangent lines to the curve \(y = \frac{2x}{x + 1}\) pass through the point \((2, 4)\)? At which points do these tangent lines touch the curve? Illustrate with a graph.

Comments: Some of these problems require you to solve a system of algebraic equations. You’ll use calculus to create those systems of equations, then use algebra to finish solving them. You may use a tool like a TI-89 to check your answer, but to get full credit you must solve the systems of equations by hand and include that work in your solution.