Worksheet 1 - lines and tangent lines

If you had trouble with question 1, do these problems.

1. Find the line through the points (3, 0) and (0, 2).
   Method 1: If the slope is \( m \), and the point \((x_0, y_0)\) is on the line, one equation for the line is
   \[
   y - y_0 = m(x - x_0).
   \]
   Method 2: Cool fact: the line through \((a, 0)\) and \((0, b)\) can be written \(x/a + y/b = 1\).

2. Find an equation for the line through (4,0) and (0,-5).

3. Find an equation for the line through the points (1,1) and (4,5) using the first method.

4. Graph the lines \(x + y = 1\) and \(y - x = 1\).

5. Suppose that a right triangle has vertices \((0,0)\), \((0,10)\), and \((4,0)\). How wide across is the triangle at height \(y = 3\)?

6. Find the equation of the tangent line to \(f(x) = x^2\) at \(x = 1\).

7. Plug \(x = 1.1\) into your tangent line from the last problem. How close is the resulting \(y\) value to \(f(1.1)\)? Is the tangent line a good approximation to the curve near \(x = 1\)?

8. For which values of \(x\) does the tangent line approximation in the previous problem have error less than 1/10?