Math 165 - Quiz 5C, Implicit Differentiation - solutions

Problem 1 A function $y = f(x)$ satisfies the equation

$$x^3 + xy^2 - 2y = 4$$

a) Find $f'(x)$ using implicit differentiation.
b) Find an equation of the tangent line to the graph of $f(x)$ at the point $(1, 3)$.

Solution Differentiate both sides with respect to $x$, using Chain Rule and Product Rule where appropriate:

$$3x^2 + y^2 + 2xyy' - 2y' = 0$$

Then solve for $y'$, so

$$y' = \frac{-3x^2 + y^2}{2xy - 2}$$

b) With $x = 1$ and $y = 3$, $y'(3) = -12/4 = -3$. So the tangent line has equation

$$y = -3(x - 1) + 3.$$