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

$$4 - xy^2 - 2y = 5$$

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

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

$$-y^2 - 2xyy' - 2y' = 0$$

Then solve for $y'$, so

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

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

$$y = \frac{1}{4}(x + 3) + 1.$$