Use implicit differentiation to find $dy/dx$ of the following equations. Recall that $y = f(x)$.

1. $x^2y + xy^2 = 3x$
   \[
   2xy + x^2y' + y^2 + x(2yy') = 3 \\
   (x^2 + 2xy)y' = 3 - 2xy - y^2 \\
   y' = \frac{3 - 2xy - y^2}{x^2 + 2xy}
   \]

2. $x^2 - 2xy + y^3 = 4$
   \[
   2x - 2y - 2xy' + 3y^2 y' = 0 \\
   (3y^2 - 2x) y' = 2y - 2x \\
   y' = \frac{2y - 2x}{3y^2 - 2x}
   \]

Use implicit differentiation to find the equation of the tangent line of the following equations through the point given. Recall that $dy/dx$ is the slope of the tangent line.

3. Consider a lemniscate which is given by the following equation:
   \[
   2(x^2 + y^2)^2 = 25(x^2 - y^2)
   \]
   and the point $(3, 1)$
   \[
   4(x^2 + 2yy')(2x + 2yy') = 25 (2x - 2yy')
   \]
   \[
   4(9 + 1)(6 + 2y') = 25 (6 - 2y')
   \]
   \[
   40 (6 + 2y') = 150 - 50y' \\
   240 + 80y' = 150 - 50y' \\
   130 y' = -90 \\
   y' = -\frac{9}{13} = m
   \]
   \[
   y - 1 = -\frac{9}{13} (x - 3) \\
   y = -\frac{9}{13} x + \frac{40}{13}
   \]

4. Consider a devil’s curve which is given by the following equation:
   \[
   y^2(y^2 - 4) = x^2(x^2 - 5)
   \]
   and the point $(0, -2)$
   \[
   4y^3 y' - 8y y' = 4x^2 - 10x \\
   4(-2)^3 y' - 8(-2) y' = 0 \\
   -24y' + 16y' = 0 \\
   -8y' = 0 \\
   y' = 0 = m
   \]
   \[
   y - (-2) = 0 (x - 0) \\
   y = -2
   \]