

Implicit Differentiation Classwork

1.

Consider the curve defined by $x^2 + xy + y^2 = 27$.

- (a) Write an expression for the slope of the curve at any point (x, y) .
- (b) Determine whether the lines tangent to the curve at the x -intercepts of the curve are parallel. Show the analysis that leads to your conclusion.
- (c) Find the points on the curve where the lines tangent to the curve are vertical.

2.

Consider the curve given by $xy^2 - x^3y = 6$.

- (a) Show that $\frac{dy}{dx} = \frac{3x^2y - y^2}{2xy - x^3}$.
- (b) Find all points on the curve whose x -coordinate is 1, and write an equation for the tangent line at each of these points.
- (c) Find the x -coordinate of each point on the curve where the tangent line is vertical.

3.

Consider the curve given by $y^2 = 2 + xy$.

- (a) Show that $\frac{dy}{dx} = \frac{y}{2y - x}$.
- (b) Find all points (x, y) on the curve where the line tangent to the curve has slope $\frac{1}{2}$.
- (c) Show that there are no points (x, y) on the curve where the line tangent to the curve is horizontal.
- (d) Let x and y be functions of time t that are related by the equation $y^2 = 2 + xy$. At time $t = 5$, the value of y is 3 and $\frac{dy}{dt} = 6$. Find the value of $\frac{dx}{dt}$ at time $t = 5$.