

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

## Derivatives of Implicit Functions

Find the derivatives of implicit functions:

$$x^2 + y^2 = 25$$

$$2x + 2yy' = 0$$

$$y' = \frac{-x}{y}$$

$$x^3 + y^3 = 4$$

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

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

$$y^3 - x^2 = -10$$

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

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

$$(x-y)^2 = x+y-1$$

$$2(x-y)(1-y') = 1+y'$$

$$2(x-xy' - y + yy') = 1+y'$$

$$2x - 2xy' - 2y + 2yy' = 1+y'$$

$$2xy' - 2xy' - y' = 2y - 2x + 1 \Rightarrow y' = \frac{2y - 2x + 1}{2y - 2x - 1}$$

$$x^2 y^3 + x^3 y^2 = 1$$

$$x^2 3y^2 y' + y^3 (2x) + x^3 2y y' + y^2 (3x^2) = 0$$

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

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

$$x = 3 + \sqrt{x^2 + y^2}$$

$$1 = \frac{2x + 2y y'}{2\sqrt{x^2 + y^2}} = \frac{x + y y'}{\sqrt{x^2 + y^2}}$$

$$\boxed{\frac{\sqrt{x^2 + y^2} - x}{y} = y'}$$

$$y^4 = 4x^3 + 5x - 3y + 1$$

$$4y^3 y' = 12x^2 + 5 - 3y'$$

$$y'(4y^3 + 3) = 12x^2 + 5$$

$$y' = \frac{12x^2 + 5}{4y^3 + 3}$$

$$e^{xy} = e^{4x} - e^{5y}$$

$$e^{xy}(xy' + y) = e^{4x} \cdot 4 - e^{5y} \cdot 5y'$$

$$xy'e^{xy} + ye^{xy} = 4e^{4x} - 5y'e^{5y}$$

$$y' = \frac{4e^{4x} - ye^{xy}}{xe^{xy} + 5e^{5y}}$$

$$x = \cos(xy)$$

$$1 = -\sin(xy)(xy' + y)$$

$$\frac{1}{-\sin(xy)} = xy' + y$$

$$-\frac{1}{\sin(xy)} = xy'$$

$$\frac{-1}{x \sin(xy)} = y'$$

$$\sin(2x + 5y) = y$$

$$\cos(2x + 5y)(2 + 5y') = y'$$

$$2\cos(2x + 5y) + 5y'\cos(2x + 5y) = y'$$

$$y'(5\cos(2x + 5y) - 1) = -2\cos(2x + 5y)$$

$$y' = \frac{-2\cos(2x + 5y)}{5\cos(2x + 5y) - 1}$$