

Name: _____

Recitation Section: _____

Show your work.

1. (7 pts) Using implicit differentiation, find $\frac{dy}{dx}$ for $(x^2 + y^2)^2 = x - y$.

What is $\frac{dy}{dx}$ at $(1, -1)$?

$$2(x^2 + y^2) \left(2x + 2y \frac{dy}{dx} \right) = 1 - \frac{dy}{dx}$$

$$4x(x^2 + y^2) + 4y(x^2 + y^2) \frac{dy}{dx} + \frac{dy}{dx} = 1$$

$$\frac{dy}{dx} (1 + 4y(x^2 + y^2)) = 1 - 4x(x^2 + y^2)$$

$$\frac{dy}{dx} = \frac{1 - 4x(x^2 + y^2)}{1 + 4y(x^2 + y^2)}$$

$$\text{At } (1, -1), \frac{dy}{dx} = \frac{1 - 8}{1 - 8} = 1.$$

2. (3 points) Find $\frac{dy}{dx}$ for

$$x = 2t - 5, \quad y = 4t - 7, \quad -\infty < t < \infty.$$

$$\frac{dx}{dt} = 2, \quad \frac{dy}{dt} = 4$$

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = 4/2 = 2$$