

Day 2 Related Rates HW:

73 AB3/BC 1

$$x + xy + 2y^2 = 6$$

$$a) 1 + (x \cdot \frac{dy}{dx} + y) + 4y \frac{dy}{dx} = 0$$

$$1 + x \frac{dy}{dx} + y + 4y \frac{dy}{dx} = 0$$

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

$$\frac{dy}{dx} = \frac{-y-1}{x+4y}$$

$$b) \left. \frac{dy}{dx} \right|_{(2,1)} = \frac{-1-1}{2+4(1)} = \frac{-2}{6} = -\frac{1}{3}$$

$$y-1 = -\frac{1}{3}(x-2)$$

$$c) -\frac{1}{3} = \frac{-y-1}{x+4y}$$

$$-x - 4y = -3y - 3$$

$$-x = y - 3$$

$$x = 3 - y$$

$$3 - y + (3 - y)y + 2y^2 = 6$$

$$3 - y + 3y - y^2 + 2y^2 = 6$$

$$y^2 + 2y - 3 = 0$$

$$(y+3)(y-1) = 0$$

$$y = -3$$

$$y = 1$$

$$(6, -3) \text{ and } (2, 1)$$

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

$$E \quad 6x + (2x \cdot \frac{dy}{dx} + y \cdot 2) + 2y \frac{dy}{dx} = 0$$

$$6x + 2x \frac{dy}{dx} + 2y + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} (2x + 2y) = -6x - 2y$$

$$\frac{dy}{dx} = \frac{-6x - 2y}{2x + 2y}$$

$$\frac{dy}{dx} \Big|_{(1, -1)} = \frac{-6 + 2}{2 - 2} \rightarrow \text{undefined}$$

$$x = 1$$

$$3(1)^2 + 2(1)y + y^2 = 2$$

$$3 + 2y + y^2 = 2$$

$$y^2 + 2y + 1 = 0$$

$$(y + 1)^2 = 0$$

$$y = -1$$

$$2) \frac{dA}{dt} = 2 \frac{dr}{dt}$$

C

$$A = \pi r^2$$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$$2 \frac{dr}{dt} = 2\pi r \frac{dr}{dt}$$

$$2 = 2\pi r$$

$$r = \frac{1}{\pi}$$

$$3) x^2 + xy + y^3 = 0$$

$$A \quad 2x + (x \cdot \frac{dy}{dx} + y) + 3y^2 \frac{dy}{dx} = 0$$

$$2x + x \frac{dy}{dx} + y + 3y^2 \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-2x - y}{x + 3y^2} = - \frac{2x + y}{x + 3y^2}$$

$$4) \frac{dA}{dt} = 96\pi$$

$$A = 64\pi$$

$$\frac{dr}{dt} = ?$$

$$A = \pi r^2$$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$$96\pi = 2\pi(8) \frac{dr}{dt}$$

$$6 = \frac{dr}{dt}$$

$$A = \pi r^2 = 64\pi$$

$$r^2 = 64$$

$$r = 8$$