MA 16010 Quiz 7 (Lessons 14–16)

Write your name, section number (399 for 8:30, 418 for 9:30), and quiz number on the top of your quiz, **front and back.**

You may use a one–line calculator.

1. Using implicit differentiation, find $\frac{dy}{dx}$ when

$$4xy + 2x^2 = y^3 \ .$$

2. A ladder of length 5 m leaning on a wall is sliding down. Currently, the base of the ladder is 3 m away from the wall and is sliding away from the wall at the rate 0.25 m/sec. At what rate is the top of the ladder sliding down?

1.

$$4xy + 2x^2 = y^3 \quad \Big| \frac{d}{dx}[\dots]$$

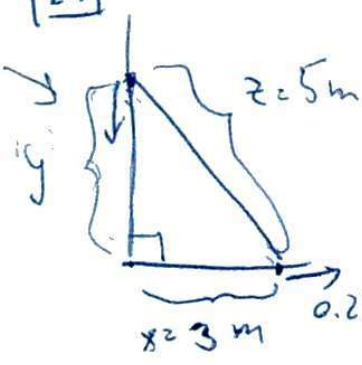
$$4y + 4x\frac{dy}{dx} + 4x = 3y^2 \cdot \frac{dy}{dx}$$

(product rule; chain rule)

$$4x\frac{dy}{dx} - 3y^2\frac{dy}{dx} = -4y - 4x$$

$$(4x - 3y^2)\frac{dy}{dx} = -4y - 4x \rightarrow \boxed{\frac{dy}{dx} = \frac{-4x - 4y}{4x - 3y^2}}$$

2.



$\frac{dy}{dt}$

1. To find y:

$$3^2 + y^2 = 5^2$$
$$9 + y^2 = 25$$
$$y^2 = 25 - 9 = 16 \rightarrow y = \sqrt{16} = 4 \text{ m}$$

2. $x^2 + y^2 = z^2 \quad \Big| \frac{d}{dt}$ (= 0.1875 m/s)

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$$

$x = 3, y = 4, z = 5, \ \frac{dx}{dt} = \frac{1}{4} (= 0.25), \ \frac{dz}{dt} = 0$

$$\rightsquigarrow 6 \cdot \frac{1}{4} + 8 \cdot \frac{dy}{dt} = 0 \rightsquigarrow \frac{dy}{dt} = -\frac{6}{8} = -3/16 \text{ m/s}$$