Name: Solutions

Math 1300-005 - Spring 2017

Quiz 7 - 3/3/17

On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work.

Signature: _____

Guidelines: You are permitted to use notes, the book, in-class worksheets/solutions, and your classmates on this quiz. Computers and graphing technology of any kind, including calculators, are not allowed (exceptions made for those who have an e-book). Please show all work and clearly denote your answer.

1. Consider the curve described by points satisfying the equation

$$x^2 + 2x^4y^3 = 14 + y^2 - x.$$

Find an equation of the tangent line to the curve at the point $(1, 2)$.

PR

$$\frac{d}{dx}(x^2 + 2x^4y^3) = \frac{d}{dx}(14 + y^2 - x)$$

$$2x + 8x^3y^3 + 6x^4y^2 \cdot y' = 2y \cdot y' - 1$$

$$6x^4y^2y' - 2y \cdot y' = -1 - 2x - 8x^3y^3$$

$$y'(6x^4y^2 - 2y) = -1 - 2x - 8x^3y^3$$

$$y' = \frac{-1 - 2x - 8x^3y^3}{6x^4y^2 - 2y}$$

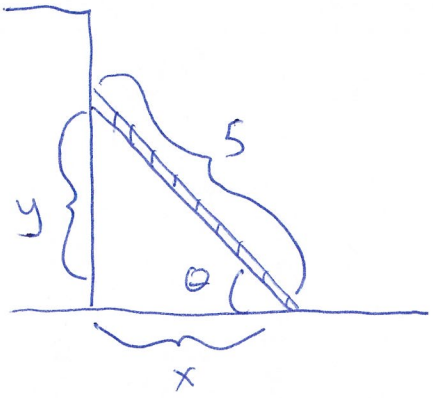
At $(1,2)$,

$$y' = \frac{-1 - 2(1) - 8(1)^3(2)^3}{6(1)^4(2)^2 - 2(2)} = \frac{-67}{20}$$

Thus the tangent line is

$$y - 2 = \frac{-67}{20}(x - 1)$$

2. A 5 meter long ladder is leaning against the side of a building. If the bottom of the ladder is pulled away from the wall so that the angle between the ladder and the ground is changing at a rate of -3 rad/s, at what rate is the distance between the bottom of the ladder and the wall changing when the top of the ladders is 3 meters from the ground?



Known: $\frac{d\theta}{dt} = -3$ rad/s

unknown: $\frac{dx}{dt}$ when $y = 3$ m

Relation: $\cos(\theta) = \frac{x}{5} \leftrightarrow x = 5\cos(\theta)$.

So $\frac{dx}{dt} = 5(-\sin(\theta))\frac{d\theta}{dt}$. when $y=3$, $\sin(\theta) = \frac{Opp}{Hyp} = \frac{3}{5}$.

So $\frac{dx}{dt} = 5\left(-\frac{3}{5}\right)(-3) = \boxed{9 \text{ m/s}}$