

Professor Bari
Math 2003 || Exam # 3 (Closed book)

Name	Answer key	Section		Date	Dec 02, 2015
Topics: Chapter: 2.6, 2.7, 2.8, 2.10 Appendix A.1, A.2, A.3				Maximum points possible: 100	
Items	Points	Your score			
Question 1	10				
Question 2	10				
Question 3	10				
Question 4	10				
Question 5	10				
Question 6	10				
Question 7	10				
Question 8	10				
Question 9	10				
Question 10	10				
You have earned					

Reminder
 add 10 to everyone
 Final score!

1. $\sqrt{\frac{x^2+6}{x^2+16}}$ Find the slope of the tangent line at 1

$$\begin{aligned}
 &= \frac{\sqrt{x^2+6}}{\sqrt{x^2+16}} \Rightarrow \frac{(x^2+6)^{\frac{1}{2}}}{(x^2+16)^{\frac{1}{2}}} \quad \frac{T'B - B'T}{B^2} \\
 &= \frac{\frac{1}{2}(x^2+6)^{-\frac{1}{2}}(2x)(\sqrt{x^2+16}) - \frac{1}{2}(x^2+16)^{-\frac{1}{2}}(2x)(\sqrt{x^2+6})}{x^2+16} \\
 &= \frac{\frac{1}{2}(x^2+6)^{-\frac{1}{2}}(2x)(\sqrt{x^2+16})}{x^2+16} - \frac{\frac{1}{2}(x^2+16)^{-\frac{1}{2}}(2x)(\sqrt{x^2+6})}{x^2+16} \\
 &= \frac{x(\sqrt{x^2+16})}{(\sqrt{x^2+6})(x^2+16)} - \frac{x(\sqrt{x^2+6})}{(\sqrt{x^2+16})(x^2+16)} \Rightarrow \frac{1(\sqrt{17})}{(\sqrt{7})(17)} - \frac{\sqrt{17}}{(\sqrt{17})(17)} \\
 &= \frac{4 \cdot 12}{44 \cdot 97} - \frac{4 \cdot 12}{70 \cdot 04} \Rightarrow 0.09 - 0.032 \Rightarrow \boxed{0.58} \\
 &\text{SLOPE OF tangent line}
 \end{aligned}$$

2. Find Y prime if $3x^2y^4 - 2y^2x^2 + 3y^5 = 17^{2000}$

$$3(x^2y^4) - 2(x^2y^2) + 3y^5 = 17^{2000}$$

F S

F S

— Algebra

F'S + S'F

F'S + S'F

— Product Rule

$$3(2xy^4 + 4y^3 \frac{dy}{dx} x^2) - 2(2xy^2 + 2y x^2 \frac{dy}{dx}) + 15y^4 \frac{dy}{dx} = 0$$

$$6xy^4 + \underline{12x^2y^3 \frac{dy}{dx}} - 4xy^2 - \underline{4x^2y \frac{dy}{dx}} + \underline{15y^4 \frac{dy}{dx}} = 0$$

Keep $\frac{dy}{dx}$ on LHS

RHS

$$12x^2y^3 \frac{dy}{dx} - 4x^2y \frac{dy}{dx} + 15y^4 \frac{dy}{dx} = 4xy^2 - 6xy^4$$

$$\frac{dy}{dx} (12x^2y^3 - 4x^2y + 15y^4) = 4xy^2 - 6xy^4$$

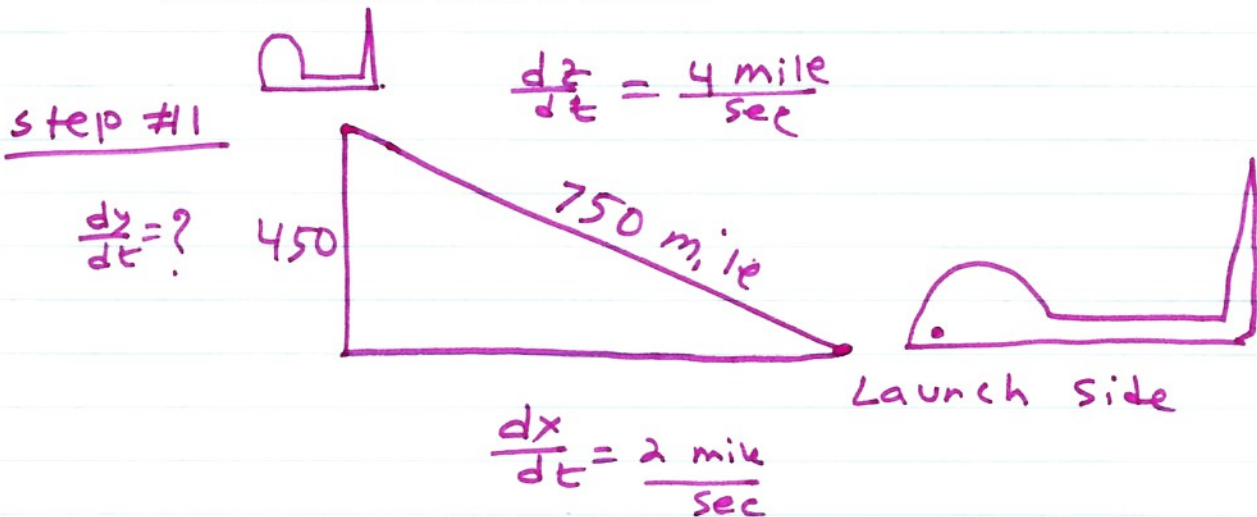
$$\frac{dy}{dx} = \frac{4xy^2 - 6xy^4}{12x^2y^3 - 4x^2y + 15y^4}$$

$$\frac{dy}{dx} (1,2) = \frac{4(1)(4) - 6(1)(16)}{12(1)(8) - 4(1)(2) + 15(16)}$$

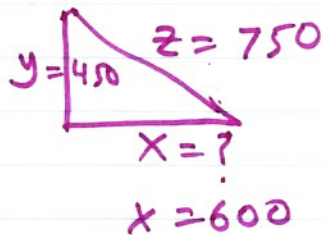
$$= \frac{16 - 96}{96 - 8 + 240}$$

$$= \frac{-80}{328} = \boxed{-0.25}$$

3. A space shuttle is launched and is moving away from the launch site with a constant velocity of 4 mile per second. Suppose that the range is increasing at the rate of 2 miles per second. At what rate is the altitude changing when the shuttle is 750 miles from the launch site and at an altitude of 450 miles?



step #2



$$a^2 + b^2 = c^2$$

$$\swarrow \quad \nwarrow$$

$$x^2 + y^2 = z^2$$

$$x^2 = z^2 - y^2$$

$$x = \sqrt{750^2 - 450^2}$$

$$x = \sqrt{360,000}$$

$$x = 600$$

step #3

$$x^2 + y^2 = z^2$$

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

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

$$600(2) + 450 \frac{dy}{dt} = 750(4)$$

$$450 \frac{dy}{dt} = 3000 - 1200$$

$$\frac{dy}{dt} = \frac{1800}{450}$$

$$\boxed{\frac{dy}{dt} = 4 \text{ mile/sec}}$$

