Math 21A
Kouba
Discussion Sheet 7

1.) Use the Intermediate Value Theorem to verify that the following equation is solvable, then use Newton's Method to estimate the value of the solution to four decimal places : $(x-1)^3 = 10 + \sqrt{x}$

2.) Find the slope and concavity of the graph of $xy^2 + y = 2$ at $x = 0$ and at $x = 1$. Sketch the graph of this equation.

3.) The volume V of a sphere is changing at the rate of π ft.^{3}/min. At what rate is the sphere's surface area S changing when

a.) S $= 4\pi$ ft.^{2} ? b.) S $= 36\pi$ ft.^{2} ?

4.) Find the height h and radius r of a right circular cone of maximum volume which can be inscribed in a sphere of radius 1 ft.

5.) Car B is 30 miles directly east of car A and begins moving west at 90 mph. At the same moment car A begins moving north at 60 mph.

a.) At what rate is the distance between the cars changing after t $= \frac{1}{5}$ hr. ? t $= \frac{1}{3}$ hr. ?

b.) What is the minimum distance between the cars and at what time t does the minimum distance occur ?

6.) Assume that $x^2 + (5-y)^3 = 2x + 125$.

a.) Find $y' = \frac{dy}{dx}$ at the point $(0,0)$ using implicit differentiation.

b.) Solve the original equation for y. Then find $y' = \frac{dy}{dx}$ at the point $(0,0)$ using ordinary differentiation.

7.) A conical tank (point down) has height 10 ft. and base radius 8 ft. Water begins flowing into the tank at the rate of π ft.^{3}/sec. At what rate is the depth h of the water changing

a.) when h = 1 ft. ? b.) when h = 9 ft. ?

8.) Assume that $xy^2 = x + \tan y$. Write $y'' = \frac{d^2y}{dx^2}$ in terms of x and y only .

9.) Use differentials to estimate the value of $(9900)^{\frac{1}{4}}$.

10.) The radius of a sphere is measured with absolute percentage error of at most 4%. Use differentials to estimate the maximum absolute percentage error in computing the sphere's

a.) surface area. b.) volume.

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The following problem is for recreational purposes only.

11.) Write a formula which will determine the nth term in the following list for n = 1, 2, 3, 4, 5, 6, $\cdots$. What is the 137th number in this list ?

5, 9, 13, 17, 21, 25, . . .