

**Worksheet #4**

(Due Friday, September 6)

**Problem 1.** For the following expressions, calculate  $\frac{dy}{dx}$ .

a)  $x^3 + y^3 = xy$

b)  $xy^2 = x^2y$

c)  $x^2 + xy + y^2 = 2x$

**Problem 2.** A 10 foot ladder leans against a wall. The base of the ladder slides horizontally away from the wall at 2 feet per second. As a result, the top of the ladder moves down the wall. How quickly is the top of the ladder sliding down the wall when the bottom of the ladder is 1 foot away of the wall?

**Problem 3.** Identify the intervals in which the following functions are increasing or decreasing.

a)  $f(x) = x^4 - x^2 + 1$

b)  $f(x) = \sqrt[3]{((x^3 - x^2)^2)}$

**Problem 4.** Identify the critical points of the following function and classify them.

$$f(x) = \sqrt[5]{x^3 + x^2 - 2x}$$

**Problem 5.** The probability of survival of sugar crops and maize crops through drought has been studied for 8 years. On the eight year, the probability of survival of sugar was 0.60, while the probability of survival of maize was 0.83. Based on the information of previous year, at the eight year the survival probability of sugar was being reduced at a rate of 0.02/year, and the survival probability of maize was being reduced at a rate of 0.08/year.

a) Using marginal analysis, estimate the probability of survival of a sugar plant in the ninth year of drought.

b) Using marginal analysis, estimate the probability of survival of a maize plant in the ninth year of drought.

c) Using marginal analysis, estimate the joint probability of survival of a sugar plant and a maize plant in the ninth year of drought. (Hint: The joint probability of two events happening is the product of the probabilities of those two events).