MATH 1325 **NAME**_____

CALCULUS FOR BUSINESS AND SOCIAL SCIENCES

Lab 3 – Applications of the Derivative

Instructions: Please show all work, and write your solutions to the problems neatly on this handout. Draw box around your final answer. If you need help, please feel free to consult with me or go to the Math Lab and ask for assistance.

1. Find the absolute extrema of the function $f(x) = x^3 - 3x$ on the interval [–10, 0].

The absolute MAXIMUM occurs at the point: _____

The absolute MINIMUM occurs at the point: _____

2. The total profit (in hundreds of dollars) from the sale of x hundred boxes of candy is given by

$$P(x) = -x^3 + 10x^2 - 12x\,.$$

a) Find the number of boxes of candy that should be sold in order to maximize profit.

b) What is the maximum profit?

3. Let $y^3 + 2x^2y - 8y = x^3 + 19$.

a. Find $^{dy}/_{dx}$ using <u>implicit</u> differentiation.

b. Use the derivative in part (a) to find the equation of the tangent line to the graph of $y^3 + 2x^2 y - 8y = x^3 + 19$ at the point (2, 3).

4. Given $f(x) = -x^3 - 12x^2 - 45x + 2$, find the open intervals where the function is concave upward or concave downward. Find any points of inflection.

5. Suppose a box is to be manufactured with a volume of 36 ft^3 that is open on top and twice as long as it is wide. Find the dimensions of the box requiring the minimum amount of material.

6. A study of the demand for air travel in Australia found that the demand for discount air travel from Sydney to Melbourne depends on the airfare according to the equation q = 55.2 – 0.22p.

a. Find the elasticity when the price is $166.10. (round your answer to 2 decimals)

b. When the price is $166.10, the demand is _____,
(elastic/inelastic)
which means that as price _____, the revenue will _____.
(increases/decreases) (increase/decrease)

7. For the function $f(x) = 3x^4 + 8x^3 - 18x^2 + 5$, find:

a. the critical numbers;

b. the open intervals where the function is increasing;

c. the open intervals where the function is decreasing.