King Fahd University of Petroleum and Minerals | Serial #: ____ St. Number: _____
Department of Mathematical Sciences | Name: _____
Instructor: M. Z. Abu-Sbeih | Math - 132.6 | Test No. II | Date: 21-4-2013.

Note: Show all your work. No credits for answers not supported by work.

Problem 1: (25 points) Consider the function $y = f(x) = 3x - x^3$

a. Find the critical numbers.

b. Find intervals where the function is increasing and those where it is decreasing.

c. Find the local maximum and minimum of the function.

d. Discuss the concavity of the function and find the infection points.

e. Sketch the graph of the function. Clearly indicate the critical numbers, extrema and inflection points.

Problem 2: (10 points) Find all vertical and horizontal asymptotes of $y = \dfrac{x}{1-x}$.

Problem 3: (10 points) The demand equation for a certain product is $p = \dfrac{80-q}{4}$; $0 \le q \le 80$, where q is the number of units and p is the price per unit. At what value of q will there be a maximum ***revenue r***? What is this maximum revenue?

Problem 4: (10 points) Suppose that the profit (in reyal) of producing q units of a certain prodict is $p = 300q - 3q^2 - 400.$ Using differentials, find the approximate change in profit if the level of production changes from $q = 90$ to $q = 91$.

Problem 5: (10 points) Find the area enclosed by the graphs of $y = 2 - x^2$ and $y = x$.

Problem 6: (35 points) Evaluate the integrals:

(a) $\int_0^1 \sqrt{x}\,(x+2)dx$

(b) $\int \dfrac{e^x + e^{2x}}{e^x} dx$

(c) $\int \dfrac{x+1}{x^2+2x+4} dx$

(d) $D_x\left(\int_1^3 \sqrt{x^3 + x}\, dx\right)$

(e) $\int \dfrac{d}{dx}\left(\dfrac{2^x}{\sqrt{x^4+3}}\right) dx$