Prince Sultan University
MATH 211
Major II Exam
Second Semester 2009/2010, Term 092

Time Allowed: 90 minutes

Name: _____ ID _____

Q1. When a certain commodity is sold for p dollars per unit, consumers will buy $D(p) = \frac{40000}{p}$ units per month. It is estimated that t months from now, the price of the commodity will be $p(t) = 0.4t^{3/2} + 6.8$ dollars per unit. At what percentage rate will the monthly demand for the commodity change with respect to time 4 months from now?

Q2. A manufacturer's total cost is $C(q) = 0.1q^3 - 0.5q^2 + 500q + 200$ dollars when the level of production is q units.

a) Use marginal analysis to estimate the cost producing the 4^{th} unit.

b) Find the actual cost of producing the 4^{th} unit.

c) If the current level of production is 4 units and the manufacturer is planning to increase this to 4.1 units, estimate how the total cost will change as a result.

Q3. When the price of a certain commodity is p dollars per unit, the manufacturer willing to supply *x* thousand units of the commodity, where $x^2 - 2x\sqrt{p} - p^2 = 31$ How fast the supply changing with respect to time t when the price is 9 dollars per unit and is increasing at the rate of 0.2 dollars per week?

Q4. Sketch a possible graph for a function *f*(*x*) that has the following properties:
$f'(x) > 0 \; for -2 < x < 2$ and
$f''(x) > 0 \; for -3 < x < 0 \text{ and } x > 4$

Q5. A manufacturer estimates that when x units of a particular commodity are produced, the market price p (dollars per unit) is given by the function

$p = 300e^{-0.01x}$. How much revenue is obtained when 200 units are produced?

Q6. Use Calculus to sketch the graph of the function $f(x) = 3x^4 - 4x^2 + 3$ (show all your steps)

Q7. Saudi airline determines that when a round-trip ticket between Riyadh and Jeddah costs p Riyals ($0 \leq p \leq 160$), the daily demand for tickets is $q = 256 - 0.01p^2$ tickets.

a) Express the elasticity of demand as a function of *p*.

b) Determine where the demand is elastic, inelastic and of unit elasticity.

c) Find the maximum revenue that the airline can make.

Q8. A manufacturer estimates that when *q* units of a particular commodity are produced, the profit obtained is *P*(*q*) thousand dollars, where

$$P(q) = -2q^2 + 68q - 128.$$

a) At what level of production the maximum average profit is obtained?

b) Find the maximum and the minimum profit obtained when level of production produced is between 15 and 20 units.