

Prince Sultan University
Department of Mathematical Sciences
MATH 211 – Major Exam I
30 October 2010



Name _____ ID _____

Q1. (12 points) The total cost of manufacturing q units of a particular commodity is

$$C(q) = 0.6q^2 - 0.4q + 4 \text{ dollars.}$$

- a) Compute the manufacturing cost of the 7th unit.

- b) Compute the average cost of producing 7 units.

- c) Determine the level of production where is cost is minimum.

Q2. (6 points) Find the domain of the function $f(x) = \sqrt{3 - 2x - x^2}$.

Q3. (3 points) Graph the function

$$f(x) = \begin{cases} x + 2 & \text{if } x \geq 2 \\ x - 2 & \text{if } x < 2 \end{cases}$$

Q4. (9 points) Suppose the total cost of producing x thousand units of a particular commodity is $C(x) = 1.43x^2 + 18.3x + 15.6$ thousand dollars and they will be sold at the price $p(x) = -0.02x + 29$ dollars per unit.

a) Find the revenue and the profit functions.

b) Determine the level of production to break even.

c) Determine the level of production so that production is **profitable**.

Q5. (3 points) Find the equation of the line passes through the point $(-2, 4)$ with x -intercept 5.

Q6. (6 points) Evaluate the following limits.

a) $\lim_{x \rightarrow \infty} \frac{2+3x^3-4x^5}{2x^5-5x^2+1000}$

b) $\lim_{x \rightarrow 3} \frac{2x-6}{\sqrt{x+1}-2}$

Q7. (3 points) Study the continuity of the function

$$f(x) = \begin{cases} 2 - 3x & \text{if } x < -1 \\ x^2 - x + 3 & \text{if } x \geq -1 \end{cases} \quad \text{at } x = -1.$$

Q8. (3 points) Use the definition to find the derivative of the function
 $f(x) = 2x^2 - 3x$.

Q9. (6 points) Find the derivative of the functions

c) $y = \frac{8}{\sqrt{4x-5}}$

d) $y = 5x \sqrt{x^2 - 1}$

Q10. (9 points) The number of units Q of a particular commodity that will be produced when L worker-hours of labor are employed is modeled by $Q(L) = 300L^{1/3}$. Suppose that the labor level varies with time in such a way that t months from now, $L(t) = 739 + 3t - t^2$ worker-hours will be employed, for $0 \leq t \leq 12$.

a) Write Q as a function of number of months, t .

b) How many units will be produced 5 months from now?

c) At what rate will be production be changed with respect to time 5 months from now?

d) Find the percentage rate of change of production 5 months from now.