



Prince Sultan University

Department of Mathematical Sciences

Major I Exam

Semester I, 2014 FALL (151)

October 25, 2015

MATH 211 – Business Calculus

Time Allowed : 90 minutes

Maximum Points: 100 points

Name of the student: _____

ID number : _____

Section : _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 14 problems, some with several parts and a total of 6 pages. Make sure your paper has all these problems.

Question	Maximum score	Your Score
Q.1 , Q.2 , Q.3	14	
Q.4 , Q.5 , Q.6	19	
Q.7 , Q.8 ,	15	
Q.9 , Q.10	12	
Q.11 , Q.12 , Q.13 , Q.14	20	
Total	80	

20

Q.1 (5 points) : Compute the indicated values of the given function:

$$\text{a) } f(x) = \begin{cases} x^2 - 5 & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ 7 - 2x & \text{if } x > 1 \end{cases}$$

Find: a) $f(-3) =$

b) $f(1) =$

c) $f(2) =$

b) Let $f(x) = x^3 + 2$ and $g(x) = x + 3$; Find and Simplify $f(g(x))$

Q.2 (3 points): Find the domain of the function $f(x) = \frac{x+1}{x(x^2-4)}$

Q.3 (6 points): (i) Find the equation of the line passing through $(-4,1)$ and $(2,5)$

(ii) Find the point(s) of intersection (if any) of the given pair of curves.
 $3y - x = 5$ and $y + 3x = 9$

Q.4 (5 points): Supply and Demand equations are given for a particular commodity in terms of the level of production x . $S(x) = 2x + 30$; $D(x) = 360 - x$

a) Find the **equilibrium production level**, x_e and the **equilibrium price**, p_e .

b) For what values of x is there a market surplus? A market shortage?

Q.5 (5 points): Find an equation for the tangent line to the curve $y = \sqrt{4x^2 + 5x}$ at the point where $x = 1$.

Q.6 (9 points): Find the limits:

a) $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - 1}$

b) $\lim_{x \rightarrow \infty} \frac{2 - 9x^3}{6x^3 + x - 3}$

c) $\lim_{x \rightarrow 36} \frac{\sqrt{x} - 6}{x - 36}$

Q.7 (6 points): For the function, $f(x) = \begin{cases} x^2 + x - 1 & -3 < x < -1 \\ x + 1 & -1 \leq x < 1 \\ 3 - x^2 & 1 \leq x < 2 \end{cases}$

a) Is the function continuous at $x = -1$ (**Explain why or why not**)

b) Is the function continuous at $x = 1$ (**Explain why or why not**)

Q.8 (9 points): Find the derivative: (**Simplify**)

a) $y = 3\sqrt{x} - \frac{2}{x^4} + \frac{x^3}{9}$

b) $f(x) = \frac{5x^2 - 7x + 1}{5 - 4x}$

c) $f(x) = (6x - 4)(x^2 + 5)$

Q.9 (7 points): a) Find $\frac{dy}{dx}$ if $y = u^3 + 2u^2 - 3$ and $u = x^2 + x - 1$. **Simplify your answer**

b) Find $\frac{dy}{dx}$ given: $5x - x^2y^3 = 2y$

Q.10 (5 points): An appliance manufacturer can sell refrigerators for \$1,500 apiece. The manufacturer's total cost consists of a fixed overhead of \$30,000 plus production cost of \$1,000 per refrigerator.

a) How many refrigerators must be sold for the manufacturer to break even?

b) How many refrigerators must be sold for the manufacturer to make a \$10,000 profit?

Q.11 (5 points): At a certain factory, the total cost of manufacturing units during the daily production run is $C(q) = q^2 + 2q + 260$ dollars. On a typical day, $q(t) = 15t$ units are manufactured during the first hours of a production run. How much is spent during the first 3 hours of production?

Q.12 (5 points): At a certain factory, the total cost of manufacturing q units during the daily production run is $C(q) = 0.3q^2 + 0.8q + 800$ dollars. It has been determined that approximately $q(t) = t^2 + 80t$ units are manufactured during the first t hours of a production run. Compute the rate at which the total manufacturing cost is changing with respect to time 2 hours after production begins.

Q.13 (5 points): If the total cost of manufacturing q units of a certain commodity is $C(q) = 3q^2 + q + 500$.

a) Use marginal analysis to estimate the cost of producing the 31st unit, in dollars.

b) What is the actual cost of producing the 31st unit?

Q.14 (5 points): At a certain factory, the daily output is $Q(L) = 60,000L^{1/3}$ units, where L denotes the size of the labor force measured in worker-hours. Currently 1,000 worker-hours of labor are used each day. Estimate the effect on output that will be produced if the labor force is cut to 940 worker-hours.