Prince Sultan University

Deanship of Educational Services

Department of Mathematics
and General Sciences

COURSE DETAILS:

Business Calculus	**MATH 211**	**MAJOR EXAM I**
Semester:	**Spring Semester --Term 172**	
Date:	**Monday March 05, 2018**	
Time Allowed:	90 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

Page 1	**Page 2**	**Page 3**	**Page 4**	**Total**	**Total**
24	**15**	**21**	**20**	**80**	**20**

Q.1 (4 points): find the **domain** of the function $f(x)=\dfrac{x+1}{\sqrt{x^2-4}}$

Q.2 (8 points): (a) **Find the equation of the line** passing through $(3,4)$ and is perpendicular to the line: $3x+4y-6=0$

(b) **Find the point(s) of intersection** of the graphs of: $y=x^2+1$ and $y=2x+4$

Q.3 (8 points): The supply and demand functions for a particular commodity are:

$$S(x)=2x+30 \quad ; \quad D(x)=360-x$$

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

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

Q.4 (4 points): Suppose the total cost (in dollars) of producing q units of a certain commodity is given by the function $C(q)=q^3-11q^2+430q+240$ dollars. What is the cost of **producing the** 10^{th} **unit**?

Q.5 (6 points): Find the **equation of the tangent line** to the graph of $y = x^5 - 3x^3 - 5x + 2$ at $x = 1$

Q.6 (9 points): Find the limits: **Show your work**

a) $\lim_{x \to 1} \dfrac{x^2 + x - 2}{x^2 - 1}$

b) $\lim_{x \to \infty} \dfrac{5x^2 + 1}{-3x^2 + 2x - 7}$

c) $\lim_{x \to 3^+} \dfrac{x^2 - 2x + 8}{3 - x}$

Q.7 (9 points): For the function, $f(x)=\begin{cases} x^2+x-1 & -3<x<-1 \\ 3-x^2 & -1\le x<1 \\ x+5+A & 1\le x<2 \end{cases}$ find the following:

a) $\lim_{x\to -1^+} f(x) =$

b) $\lim_{x\to -1^-} f(x)$

c) Find the value of A that makes the function **continuous** at $x=1$.

Q.8 (12 points): Find the derivatives: **(Simplify reasonably)**

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

b) $y=\frac{x^2-1}{6x+4}$

c) $f(x)=(3x+5).\left(2x^5-2x\right)$

Q.9 (8 points): An appliance manufacturer can sell refrigerators for 1200 a piece. The manufacturer's total cost consists of a fixed overhead of 24000 and a production cost of 800 per refrigerator.

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

b) What is the manufacturer's **profit or loss** if sells 100 refrigerators?

Q.10 (6 points): The gross annual earnings of a certain company is given by $A(t) = 0.1t^2 + 10t + 20$ thousand dollars t years from 2010.

a) **At what rate** were the gross annual earnings of the company changing with respect to time in 2015?

b) **At what percentage rate** were the gross annual earnings of the company changing with respect to time in 2015?

Q.11 (4+2 points): A manufacturer determined that when x hundred units of a certain commodity are produced, they can be sold $p = 40 - x$ dollars.

a) Determine **the level of production,** x that results in **maximum revenue**.

b) Find the value of the **maximum revenue**.