Prince Sultan University

Deanship of Educational Services

Department of Mathematics
and General Sciences

COURSE DETAILS:

Business Calculus	**MATH 211**	**MAJOR EXAM I**
Semester:	**Fall Semester --Term 181**	
Date:	**Monday October 15, 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**
20	**18**	**22**	**20**	**80**	**20**

Q.1 (3 points): find the **domain** of the function $f(x)=\dfrac{3x-5}{x^2-5x-6}$

Q.2 (6 points): a) **Find the equation of the line** passing through $(-3,2)$ and is parallel to the line whose equation is given by: $5x+3y-7=0$

b) **Find the point of intersection** of the graphs of: $y=-3x+5$ and $y=2x-10$

Q.3 (6 points): The supply and demand functions for a particular commodity are:

$$S(q)=17q+80 \quad ; \quad D(q)=480-3q$$

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

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

Q.4 (5 points): Find the value of the constant A that will make the function f continuous at $x=3$

$$f(x)=\begin{cases}-18-3x & \text{if } x<3\\ Ax^2+2x-6 & \text{if } x\geq 3\end{cases}$$

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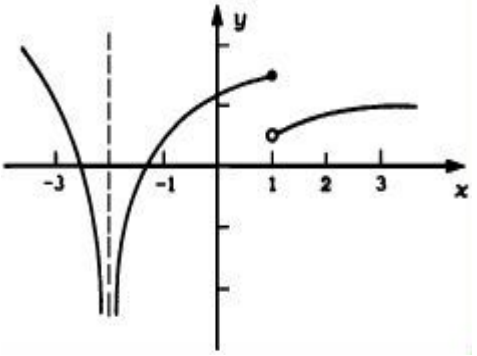
Q.5 (6 points): Use the following graph to answer the questions:



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

a) $\lim_{x \to 1^-} \frac{x - \sqrt{x}}{x - 1}$

b) $\lim_{x \to 1} \frac{x^2 - 3x + 2}{x^2 - 1}$

c) $\lim_{x \to -\infty} \frac{-3x^3 - 2x - 4}{8 + 3x + 4x^3}$

Q.7 (3 points): Let $f(x)=\begin{cases} x^2+x-1 & -3<x<-1 \\ x+2 & -1\le x<1 \\ 3-x^2 & 1\le x<2 \end{cases}$. **Find the limits**

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

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

c) $f(1) =$

Q.8 (3 points): If the profit from the sales of x units of a product is: $P(x)=-0.1x^2+300x-1200$. What **level of production** x will yield the **maximum profit**?

Q.9 (10 points): A manufacturer can sell a certain product for $\$80$ a piece. The manufacturer's total cost consists of a fixed overhead of $\$120,000$ and a production cost of $\$50$ per unit.

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

b) **How many units** must the manufacturer sell if he wants to realize (have) a profit of $\$15,000$?

Q.10 (9 points): Find the **derivative:**

a) $y=\frac{5}{x^7}-\frac{3}{x^3}+8\sqrt{x}$

b) $f(x)=\frac{5x^2-1}{\sqrt{3+2x}}$

c) $f(x) = \left(2x^3 + 3x + 1\right)\left(x^2 + 4\right)^5$

Q.11 (3+3+2 points): The profit from the sales of q units of a product is given by: $P(q) = 70q - q^2$.

a) What is the **average rate** of change in profit as the level of production changes from $q = 0$ to $q = 20$?

b) At what **rate** is the profit changing when $q = 20$?

c) At what **percentage rate** is the profit changing when $q = 20$?

Q.12 (6 points): Find the **equation of the tangent line** to the graph of $y = 6x \cdot \sqrt{3x + 1}$ at $x = 1$

Q.13 (6 points): At a certain factory, the total cost of manufacturing q units during the daily production 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. Find **the rate** at which the total manufacturing cost is changing **with respect to time** 3 hours after production begins.