Prince Sultan University

Deanship of Educational Services

Department of Mathematics and General Sciences

COURSE DETAILS:

Business Calculus	**MATH 211**	**FINAL EXAM**
Semester:	**FALL Semester --Term 181**	
Date:	**Saturday December 22, 2018**	
Time Allowed:	180 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	**486**
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
22	**21**	**21**	**16**	**80**	**40**

Q.1 (4 points): Find the following limits: **Show all your steps**

a) $\lim_{x\to 3}\dfrac{x^2-x-6}{x^2-9}$

b) $\lim_{x\to 36}\dfrac{\sqrt{x}-6}{x-36}$

Q.2 (4 points): Find the value of A for which $f(x)=\begin{cases}2x^2-6 & if \quad x\geq 1\\ -x^3+A & if \quad x<1\end{cases}$ is continuous at $x=1$

Show your work.

Q.3 (9 points): Find the derivative y'.

a) $y=\sqrt{4+e^{2x}}$

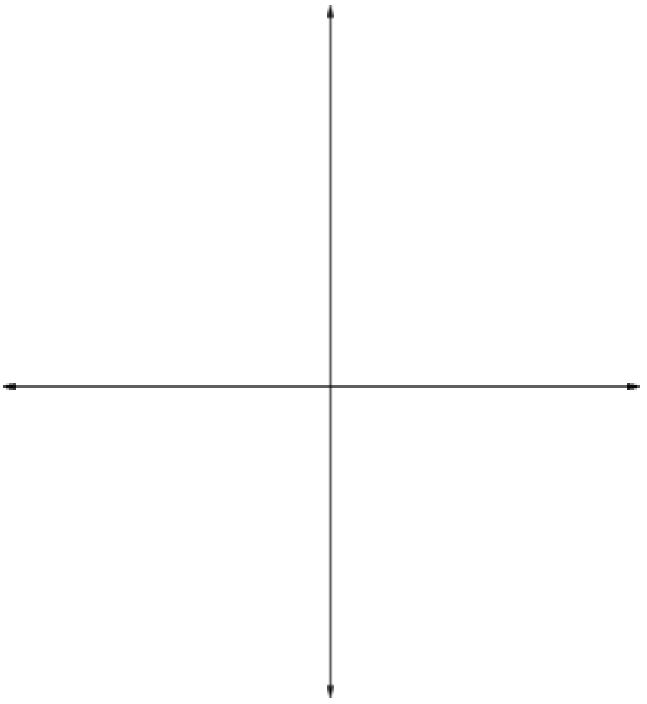
b) $x^2+y^3=xy+1$

c) $y=e^{x^2}\ln(2x^3+1)$

Q.4 (5 points): The cost of producing x units of a certain commodity is $C(x)=3x^2+4x+4$ dollars. If the price is $p(x)=(52-x)$ dollars per unit, determine the level of production, x that **maximizes the profit**.

Q.5 (12 points): Given the function $f(x) = x^5 - 5x^4$ **Show all your steps**

a) Find the critical points, if any.



b) Find the intervals of increase and decrease, if any.

c) Find the relative maximum and minimum, if any.

d) Find the intervals of concave up and concave down, if any.

e) Find the inflection points, if any.

f) Sketch the graph of f .

Q.6 (9 points): Evaluate the integrals:

a) $\int_{e}^{e^2} \frac{\sqrt{\ln(x)}}{x} dx$

b) $\int x\, e^{-6x} dx$

c) $\int (5x^6 - \frac{1}{x^3} + 8) dx$

Q.7 (6 points): Suppose that $q = 60 - 0.1p$ units of a certain commodity are demanded when p dollars per unit are charged $(0 \le p \le 600)$.

a) Find the elasticity of demand when the price is $p = \$200$.
b) Is this price ($\$200$) elastic, inelastic, or unit elasticity?
c) Should the manufacturer raise or lower this price in order to increase total revenue?

Q.8 (5 points): The marginal revenue of producing q units of a certain commodity is $R'(q) = q(10 - q)$ hundred dollars per unit. What is the total revenue that is generated as the level of production is raised from 3 to 9 units?

Q.9 (5 points): a manufacturer supplies $S(p) = 0.5p^2 + 3p + 7$ hundred units of a certain commodity to the market when the price is p dollars per unit. Find the **average supply** as the price varies from $p = \$2$ to $p = \$5$.

Q.10 (5 points): Find the area of the region bounded by the curves: $y = x + 2$ and $y = x^2 - 4$

Q.11 (5 points): At a certain factory, the marginal cost is $6(q-5)^2$ dollars per unit when the level of production is q units. **How will the total manufacturing cost change** if the level of production is increased from 10 to 13 units? Will there be an increase or decrease in the total cost?

Q.12 (5 points): It is estimated that the weekly output of a certain plant is given by the function $Q(x,y) = 1,200x + 500y + x^2y - x^3 - y^2$ units, where x is the number of skilled workers and y is the number of unskilled workers employed at the plant. Currently the workforce consists of 30 skilled workers and 60 unskilled workers.

Use marginal analysis to estimate the **change in the weekly output that will result from the addition of 1 more skilled worker** if the number of **unskilled workers is not changed**. *

Q.13 (6 points): Compute the partial derivatives, f_x, f_y f_{xx}, f_{yy}, f_{xy}, and f_{yx}.

$$f(x,y) = 7x^5y^6 + 5xy$$