Prince Sultan University

Deanship of Educational Services

Department of Mathematics and General Sciences

COURSE DETAILS:

Business Calculus	**MATH 211**	**MAJOR EXAM II**
Semester:	**Spring Semester --Term 172**	
Date:	**Monday April 16, 2018**	
Time Allowed:	90 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	**151**
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.

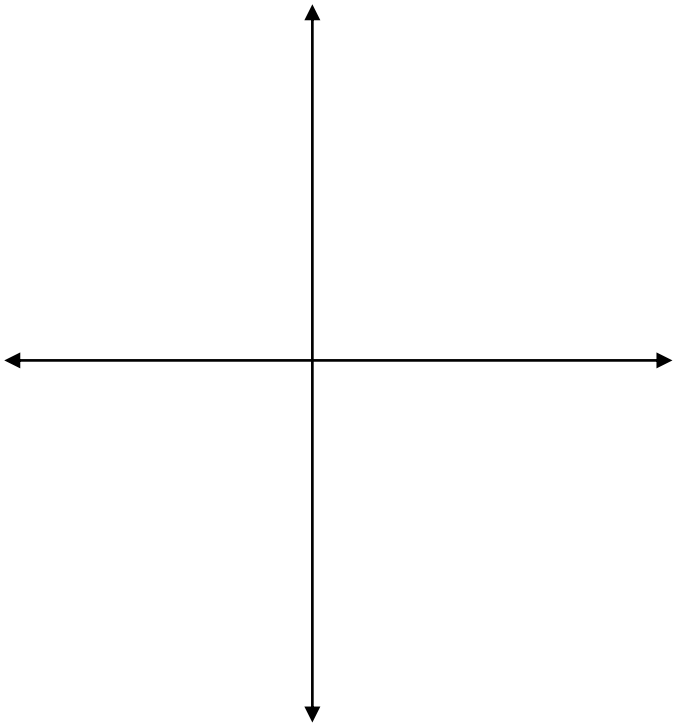
GRADING:

Page 1	**Page 2**	**Page 3**	**Page 4**	**Total**	**Total**
19	**23**	**22**	**16**	**80**	**20**

Q.1 (5 points): Find the absolute maximum and absolute minimum of $f(x) = -2x^3 + 3x^2 + 12x - 5$ in $[0,3]$

Q.2 (10 points): Consider the function $f(x) = -2x^4 + 4x^2 + 1$

a) Find the critical numbers of f



b) Find the intervals on which f is increasing and decreasing, if any.

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

d) Find the intervals on which f is concave up and concave down, if any.

e) **Sketch the graph** of showing what you found in the previous parts.

Q.3 (4 points): Use the **Second Derivative Test** to find the relative maximum and minimum, if any.

$f(x) = x^4 - 6x^2$

Q.4 (6 points): The cost of a commodity is $C(x) = 3x^2 + 5x + 75$ dollars when x thousand units are produced and the selling price is $p(x) = 35 - 2x$ dollars per unit, find the level of production, x that **maximizes the profit.**

Q.5 (6 points): If the total cost of manufacturing q units of a certain commodity is $C(q) = 4q^3 - 2q^2 + 300q$

a) Use **marginal analysis** to estimate the cost of producing the 18^{th} unit, in dollars.

b) Find **the actual cost** of producing the 18^{th} unit.

Q.6 (6 points): Solve each equation for the variable.

a) $4^{2x-x^2} = \frac{1}{64}$

b) $\log_4(4x - 1) = 3$

Q.7 (5 points): How much should you invest now at an annual interest rate of 6.25% so that your balance 10 years from now will be $20,000 if interest is compounded monthly?

Q.8 (3+3+4+4 points): Find the derivative, y'. **Simplify as much as possible.**

a) $y = \ln\left(e^{3x} + 3x^2\right)$

b) $y = \left(5x^4 - 3x^2 + 2x + 1\right)^{10}$

c) $x^3 + xy + y^3 = x$

d) $y = \dfrac{e^{-2x}(2+x^3)^5}{\sqrt{1+x^2}}$ **(Hint: use logarithmic Differentiation)**

Q.9 (8 points): Suppose that the demand equation for a certain commodity is $q = 3{,}000e^{-0.02p}$ where p is the price at which q units can be sold.

a) Find the **elasticity of demand function.**

b) Determine the price where the demand is **elastic, inelastic, or unit elasticity**.

Q.10 (10 points): Find the following integrals:

a) $\int\left(\frac{2x-3}{x^4}\right)dx$

b) $\int\frac{2x^3}{x^4+2}dx$

c) $\int(e^{-2x}+\frac{5}{x})dx$

Q.11 (6 points): The **marginal revenue** from producing q units of a certain commodity is $R'(q)=4q-1.2q^2$ dollars per unit. If the revenue from producing 20 units is \$30,000, **how much revenue** should be expected from producing 40 units?