Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

جامعة الامير سلطان
PRINCE SULTAN
UNIVERSITY
1998

COURSE DETAILS:

BUSINESS CALCULUS	MATH 211	FINAL EXAM
Semester:	Spring 2018-2019 --Term 182	
Date:	Saturday April 27, 2019	
Time Allowed:	180 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	J. Alzabut

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
Questions	1,2,3	4,5,6,7	8,9	10,11,12,13	9 Questions
Marks					80
S. Marks	22	20	16	22	

40

Q.1 (6 points) Given the function $f(x,y)=(x\ \ +2xy^3+1)^4$ find the partial derivatives f_{xx} and f_{xy}.

Q.2 (10 points) Find the following integrals:

a) $\int\left(\frac{5}{x}-\frac{2}{x^3}+4e^{\frac{1}{3}x}\right)dx$.

b) $\int(3x^2+6)\sqrt{x^3+6x}dx$

c) $\int(1-x^2)e^x dx$

Q.3 (6 points) Consider the function $f(x)=x^4-4x^3+10.$ Determine the intervals f where is concave up or concave down. Indicate the inflection points.

Q.4 (6 points) Find the derivatives of the following functions:

a) $y = x^2 e^{3x^3}$

b) $f(x) = 2^{\ln(5x^2 - 3x)}$

Q.5 (4 points) Use **implicit differentiation** to find y' for $x^2 + y^2 = y$

Q.6 (4 points) Find the *x* value where the graph of $f(x) = 3x^2 + 12x$ has a horizontal tangent line.

Q.7 (6 points) A manufacturer estimates that when *x* units of a commodity are produced, the total cost will be $C(x) = \frac{1}{4}x^2 + 3x + 67$ dollars, and that all *x* units will be sold when the price $p(x) = \frac{1}{5}(45 - x)$ dollars per unit.

a) Find the marginal cost and marginal revenue of producing and selling the 4th unit.

b) What is the **<u>actual revenue</u>** of producing the 4th unit?

Q.8 (6 points) Find all vertical and horizontal of the function $h(x)=\dfrac{5x^2}{x^2-3x-4}$.

Q.9 (10 points) Suppose that at a certain factory, output is given by the *Cobb-Douglas* production function $Q(K,L)=20K^{0.15}L^{0.85}$ units, where *K* is the capital investment measured in units of $1,000 and *L* the size of the labor force measured in worker-hours:

a) Compute the output if the capital investment is $56,500 and the size labor force is 600 worker hours.

b) Find the **marginal productivity of capital** when the capital investment is $120,000 and the size of the labor force is 800 worker hours.

c) Find the **marginal productivity of labor** when the capital investment is $120,000 and the size of the labor force is 800 worker hours.

d) Should the manufacturer consider adding a unit of capital or a unit of labor to increase output more rapidly? Explain your answer.

Q.10 (5 points) Find the equation of the tangent line to the curve $f(x) = x - \ln x$ at $x = e$.

Q.11 (5 points) Find the area of the region bounded by the curves $f(x) = x^2 - 2x$ and $g(x) = -x^2 + 4$.

Q.12 (6 points) For the function $f(t) = 2t^3 + 6t^2 + 6t + 5$, determine all critical points and classify them as relative maximum, relative minimum or neither. Indicate intervals of increase and decrease.

Q.13 (6 points) The marginal revenue derived from producing q units of a commodity is $R'(q) = 4q - 1.2q^2$ dollars per unit. If the revenue derived from producing 20 units is \$30000, find the revenue function. How much revenue should be expected from 40 units?