# Prince Sultan University

Deanship of Educational Services

Department of Mathematics and General Sciences

## COURSE DETAILS:

| **Business Calculus** | **MATH 211** | **MAJOR EXAM II** |
|---|---|---|
| Semester: | **Fall Semester --Term 181** | |
| Date: | **Monday November 26, 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 |
|---|---|---|---|---|---|
| | | | | | |
| **19** | **20** | **22** | **19** | **80** | **20** |

**Q.1 (3+2 points):** A manufacturer's total cost is $C(q) = q^3 - 5q^2 + 50q + 2000$ dollars, where $q$ is the number

of units produced.

a) Use **marginal analysis** to estimate the cost of producing the $25^{th}$ unit.

b) Compute **the actual cost** of producing the $25^{th}$ unit.

**Q.2 (6 points):** Find the **absolute maximum and minimum** of $f(x) = -2x^3 + 3x^2 + 12x - 5$ on the interval $0 \le x \le 3$

**Q.3 (4 points):** How much money should be invested today at $5.25\%$ compounded quarterly so that $10$ years from now it would be worth $\$ 25,000$ ?

**Q.4 (4 points):** How long will it take \$2,000 to grow to \$10,000 if interest is 8% compounded continuously? (Round your answer to nearest whole year)

**Q.5 (6 points):** **Solve** the equation.

a) $\log_2(x-6)=5$

c) $31=1+4e^{-6x}$

**Q.6 (3 points):** Find the vertical and horizontal asymptotes, if any for the function.

$$f(x)=\frac{1-3x^2}{4x^2-16}$$

**Q.7 (3+4+4 points):** Find the **derivative:**

a) $f(x)=e^{-5x}\ln\left(3x^4+2x\right)$

b) $$y=\frac{e^{2x}\left(2x-1\right)^6}{\left(x^3+5\right)^2(4-7x)}$$

c) $5x-x^2y^3=2y$

**Q.8 (6 points):** An average worker at a certain factory assembles $f(x) = -x^3 + 6x^2 + 16x$ units $x$ hours after arriving on the job at 8:00 A.M. for the morning shift. Approximately how many units will the worker assemble between 10:00 and 10:30 A.M.?

**Q.9 (16 points):** Find the following integrals:

a) $\int t\left(t^2+1\right)^{\frac{3}{2}} dt$

b) $\int\left(3\sqrt{x}+\frac{2}{x^5}\right)dx$

c) $\int(x-1)e^{2x^2-4x}dx$

d) $\int\frac{2}{5x+8}dx$

**Q.10 (6 points** The marginal profit of a certain commodity is: $P'(q) = 100 - 2q$ when $q$ units are produced. When 10 units are produced, the profit is \$700. What is the profit from producing 40 units?

**Q.11( 13 points) :** Given $f(x) = 3x^5 - 20x^3$

a) Find all the **critical points** of the function $f$

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

b) Determine the **relative maximum and minimum**, if any.

c) Find the **intervals of concavity** and **the inflection points**, if any.

d) **Sketch the graph** of $f$ showing all features.