PRINCE SULTAN UNIVERSITY
Department of Mathematical Sciences
MATH 211 – Business Calculus
Final Examination
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Maximum Time 180 Minutes

Q1.a Sketch a possible graph for a function f(x) with the following properties: $f'(x) > 0$ over the intervals $(-\infty, -2]$ and [0, 3] and $f''(x) > 0$ over the interval (-1, 2).

b. Find the absolute maximum and minimum of the function $f(x) = 3t^5 - 5t^3$ over the interval [-2, 0].

c. The total cost of producing q units is given by $c(q) = \frac{1}{8}q^2 + 4q + 200$ riyals at which q units are sold. Determine the level of production at which the average cost is minimized.

Q2. Find the derivative of the following functions

a. $y = \dfrac{2x^3 - 3}{4x - 1}$

b. $y = \sqrt{4 + e^{2x}}$

c. $y = \ln\left(\dfrac{x^3(2x+1)}{x^2 - 1}\right)$

Q3.a. Money deposited in a certain bank doubles every 13 years. The bank compounds interest continuously. What annual interest rate does the bank offer?

b. Find the equation of the tangent line to the curve $y = 2\ln(x+1)$ at $x = 0$.

c. Determine the critical numbers of the function $f(x) = x^3 - 4x + 5$ and classify each as a relative maximum or minimum.

Q4. Evaluate the following integral.

١. $\displaystyle\int_1^2 6x^5 - \frac{1}{x^3} + 5\, dx.$

٢. $\displaystyle\int e^{3x} + \frac{5}{x}\, dx.$

٣. $\displaystyle\int x^2\sqrt{x^3 + 9}\, dx.$

٤. $\displaystyle\int xe^x dx.$

/Q5. a. Determine the area of the region bounded by $y = 1 + 4x - x^2$ and $y = 1 + x^2$.

b. a certain section of the country, the price of chicken is currently \$2 per kilogram. It is estimated that *x* weeks from now the price will be increasing at a rate of $2\sqrt{x+1}$ cents per kilogram, per week. How much will chicken cost 3 weeks from now?

c. Suppose the total cost in Riyals of manufacturing q units is $C(q) = 3q^2 + q + 500$. Use Marginal analysis to estimate the cost of manufacturing the forty unit and compare it with the actual cost of manufacturing the forty unit.