

Q1. Use implicit differentiation to find $\frac{dy}{dx}$ explicitly in terms of x and y from
 $xy^2 = e^x + y$.

[8 pts]

Q2. If $y = \frac{x^2(x+1)^4}{x^2+4}$ find $\frac{dy}{dx}$.

[8 pts]

Q3. If $y = \frac{1}{1-2x}$, find the 1st, 2nd, 3rd and 4th derivatives of y . Guess a formula for $y^{(n)}$.

[10 pts]

Q4. Given the demand function $p = 400 - 2q$ find when marginal revenue is increasing.

[8 pts]

Q5. Find the Vertical Asymptotes of $f(x) = \ln(1-x)$. [Hint: $\lim_{x \rightarrow 0^+} \ln x = -\infty$, $\lim_{x \rightarrow +\infty} \ln x = +\infty$ and $\lim_{x \rightarrow -\infty} \ln x$ is *DNE*.]

Q6. Find the Horizontal Asymptotes of

$$y = \frac{e^x + e^{-x}}{e^x}.$$

[Hint: Multiply the numerator and denominator by e^{-x} (e^{-x}) to find the limits as x approaches $-\infty$ ($+\infty$), respectively.]

[8 pts]

Q7. If $f(x) = \frac{x}{x^3 + 2}$ find its absolute maximum and minimum on $[0, 2]$.

[8 pts]

Q8. Determine the concavity and x -values where points of inflection occur, for the function

$$f(x) = x + \frac{1}{x}.$$

[8 pts]

Q9. Find the relative maxima and minima of $f(x) = xe^x$

[8 pts]

Q10. For Al-Gossaibi Manufacturing Co., fixed costs are SR1200 and variable cost SR2 per unit, and the demand equation is $p = \frac{100}{\sqrt{q}}$. What level of output will maximize profit? What is the price at profit maximization?

[10 pts]

Q11. Sketch the complete graph of $f(x) = x + \frac{1}{x}$.

[16 pts]

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Q1. If $f(w) = (8w^2 + 2w - 3)(5w^3 + 3)$, find df/dw .

[8 pts]

Q2. Let C be the consumption function and I the regional income of GCC countries (1990-2000), if

$$C = \frac{10\sqrt{I} + 0.70125\sqrt{I^3} - 0.2I}{\sqrt{I}}$$

where C and I are expressed in billions of Saudi riyals. Find the GCC countries marginal propensity to consume when $I = 6,400$.

[8 pts]

Q3. Find p' if $p = \ln \left(\sqrt[5]{\frac{5q+1}{5q-1}} \right)$.

[8 pts]

Q4. For the normal-density function $f(x) = \frac{1}{\sqrt{2p}} e^{-x^2/2}$ ($e \approx 2.71828$), show that

$$e^p \cdot f'(-\sqrt{2p}) = 1$$

[8 pts]

Q5. Find all the asymptotes of

$$y = \frac{2(e^x + e^{-x})}{e^x - e^{-x}}.$$

[Hint: Multiply the numerator and denominator by e^x (e^{-x}) to find the limits as x approaches $-\infty$ ($+\infty$), respectively.]

[8 pts]

Q6. If $C = \left(\frac{2}{x}\right)^x$ find C' . [Hint. Use logarithmic differentiation.]

[8 pts]

Q7. If $y = 4^{2x-3}$, find $y^{(3)}$.

[8 pts]

Q8. If $C = 4q - q^2 + 2q^3$ is a total-cost function, when is marginal cost decreasing?

[8 pts]

Q9. If $f(x) = \frac{-x}{x^2 + 1}$ find its absolute extrema on $[-2, 0]$.

[8 pts]

Q10. For a manufacturer's product, the total-revenue function is given by

$$T_R = 240q + 57q^2 - q^3$$

determine the maximum revenue

[8 pts]

Q11. Determine when $f(x) = \frac{x-1}{x+1}$ is concave down.

[8 pts]

Q12. Sketch the graph of a continuous function f such that $f(3) = 5$, both $f'(x) > 0$ and $f''(x) > 0$ for $x < 3$, and both $f'(x) < 0$ and $f''(x) > 0$ for $x > 3$. Moreover, the graph of f passes through $(0, 0)$ and $(6, 0)$, and has no inflection points. [12 pts]

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