(A)

King Fahd University of Petroleum and Minerals

Department of Mathematics

Math - 106 Semester - 251 Quiz # II

Name: **S. No.:** **ID:**

Maximum Marks: 05 Section: Time Allowed: 15 Minutes

Instructions: *There are Five multiple choice questions. Each question carry equal mark. Put the right sign ($\surd$) against the correct answer. Give the answer of all questions.*

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1. If the total revenue $r = 2q(30 - 0.1q)$ of the number q of units sold, then the marginal-revenue function is

   $r = 60q - 0.2q^2$

   ✓(a) $60 - 0.4q$

   (b) $2q^2$

   (c) $60q$

   (d) $0.2q$

   Marginal-revenue $= \frac{dr}{dq} = 60 - 0.4q$

2. If $f(x) = e^{x^2} \ln x^2$, then

   ✓(a) $f'(x) = 2e^{x^2}\left[\frac{1}{x} + x \ln x^2\right]$

   (b) $f'(x) = e^{x^2}\left[\frac{1}{x} + x \ln x^2\right]$

   (c) $f'(x) = e^{x^2}\left[\frac{1}{x} + 2x \ln x^2\right]$

   (d) $f'(x) = 2e^{x^2}\left[\frac{1}{x} + 2x \ln x^2\right]$

   $f(x) = e^{x^2} \cdot 2 \ln x$

   $f'(x) = 2e^{x^2} \cdot \frac{1}{x} + 2 \ln x \cdot e^{x^2} \cdot 2x$

   $= 2e^{x^2}\left[\frac{1}{x} + 2x \ln x\right]$

   $= 2e^{x^2}\left[\frac{1}{x} + x \ln x^2\right]$

3. The slope of the curve $y = \frac{x}{\ln x}$ when $x = 3$ is

   (a) $\frac{3}{\ln 3}$

   (b) $\frac{1}{\ln 3}$

   ✓(c) $\frac{\ln 3 - 1}{(\ln 3)^2}$

   (d) $\ln 3$

   Slope of the curve is $\frac{dy}{dx}$

   $\frac{dy}{dx} = \frac{\ln x \cdot 1 - x \cdot \frac{1}{x}}{(\ln x)^2} = \frac{\ln x - 1}{(\ln x)^2}$

   Slope of the curve when $x=3$ is

   $\left.\frac{dy}{dx}\right|_{x=3} = \frac{\ln 3 - 1}{(\ln 3)^2}$

4. $\frac{d}{dx}(4^x)$ is

(a) $4x$

(b) 4^x

✓(c) $4^x(\ln 4)$

(d) $4\ln x$

$4^x = (e^{\ln 4})^x = e^{(\ln 4)x}$

$\frac{d}{dx}(4^x) = e^{(\ln 4)x} \cdot \ln 4$

$= 4^x \cdot \ln 4$

OR use the formula $\frac{d}{dx}(b^x) = b^x(\ln b)$

5. If $p = 100 - q^2$, then the rate of change of q with respect to p is

(a) $\frac{1}{p}$

(b) $2q$

(c) $\frac{1}{2q}$

✓(d) $\frac{-1}{2q}$

Differentiate $p = 100 - q^2$ with respect to q,

$\frac{dp}{dp} = \frac{d}{dp}(100 - q^2) \Leftrightarrow 1 = -2q \cdot \frac{dq}{dp}$

$\Leftrightarrow \frac{-1}{2q} = \frac{dq}{dp}$

For Rough Work