One Two academy | Differentials and Partial differentiation

Maximum Mark: 25 **Mathematics** **Time: 50 minutes**

Choose the correct answer: **3 x 1 = 3**

1. The percentage error in the 11^{th} root of the number 28 is approximately _____ times the percentage error in 28.

(a) $\frac{1}{28}$ (b) $\frac{1}{11}$ (c) 11 (d) 28

2. Linear approximation for g(x) = $\cos x$ at $x = \frac{\pi}{2}$ is

(a) $x + \frac{\pi}{2}$ (b) $-x + \frac{\pi}{2}$ (c) $x - \frac{\pi}{2}$ (d) $-x + \frac{\pi}{2}$

3. If w(x,y) = $x^y, x > 0$, then $\frac{\partial w}{\partial x}$ is equal to

(a) $x^y \log x$ (b) $y \log x$ (c) $y\, x^{y-1}$ (d) $x \log y$

Answer the following: **3 x 2 = 6**

4. Find the differential dy and evaluate dy for the given valuex of x and dx.

$$y = \cos x\,, x = \frac{\pi}{6}\ dx = 0.05$$

5. Assume that the cross-section of the artery of human is circular. A drug is given to a patient to dilate his arteries. If the radius of an artery is increased from 2 mm to 2.1 mm, how much is the cross-sectional area increased approximately?

6. Let V(x,y,z) = xy +yz + zx, x,y,z ∈ R. Find the differential dV.

Answer any two of the following: **2 x 3 = 6**

7. Let $u(x,y) = e^{-2y}\cos(2x)\ \forall\ (x,y) \in R^2$. Prove that u is harmonic function in R^2.

8. Assuming $\log_{10}$ e = 0.4343, find an approximate value of I$\log_{10}$ 1003

9. Let g(x,y) = $\frac{e^y \sin x}{x}$ for $x \neq 0$ and g(0,0) = 1. Show that g(x,y) is continuous at (0,0).

Answer the following: **2 x 5 = 10**

10. Use linear approximation to find the value of $(26)^{\frac{1}{4}}$.

11. Let $w(x,y,z) = \frac{1}{\sqrt{x^2+y^2+z^2}}\ , (x,y,z) \neq (0,0,0)$. Show that $\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} + \frac{\partial^2 w}{\partial z^2} = 0$.

OR

Let W(x,y,z) = xy + yz + zx, x = u-v, y = uv, z = u+v, $u, v \in R$. Find $\frac{\partial W}{\partial u}, \frac{\partial W}{\partial v}$.

Evaluate them at $\left(\frac{1}{2}, 1\right)$.

All the Best

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Answer Key attached in the next page !!!

This page is to prevent seeing answer key

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Answer Key

Q.no	Solution	Marks
1.	(b) $\frac{1}{11}$	**1**
2.	(b) $-x + \frac{\pi}{2}$	**1**
3.	(c) $y\, x^{y-1}$	**1**
4.	dy = - sinx dx; dy = -0.025	**2**
5.	Increased area = 0.4 π mm^2	**2**
6.	dV = (y + z) dx + (x + z) dy + (y + x) dz	**2**
7.	**Correct proof**	**3**
8.	3.0013029	**3**
9.	Correct proof	
10.	**2.963**	**5**
11.	Correct proof	**5**
	OR	
	3, $-\frac{3}{2}$	

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