

Mark {a, b, c, or d} for the correct answer in the space below for Q.1. - Q.10 [ Marks 10 x 1.5 = 15 ]

Q. No.	1	2	3	4	5	6	7	8	9	10
Select from {a,b,c,d}										

Q.1. If  $f(x) = \sin(2x)$ , then  $f''(\frac{\pi}{4})$  is

- (a) 4, (b) -4, (c)  $4\sqrt{2}$ , (d)  $-4\sqrt{2}$

Q.2. The equation of the tangent line of  $y = (1 + \sin x)^2$  at the point (0,1) is

- (a)  $y = 2x$ , (b)  $y + 2x + 1 = 0$ , (c)  $y = 2x + 1$ , (d)  $y = -2x + 1$

Q.3. If  $y = 1 + \frac{1}{x}$ , then  $y'$  is

- (a)  $\frac{1}{x^2}$ , (b)  $1 - \frac{1}{x^2}$ , (c)  $1 + \frac{1}{x^2}$ , (d) None of these

Q.4.  $f(x) = ax^2 + x + 1$  satisfies the hypotheses of Rolle's theorem on  $[1, 3]$ , then the value of 'a' is

- (a) 0, (b) 1, (c)  $\frac{1}{5}$ , (d) None of these.

Q.5. The linear approximation of the  $f(x) = 1 + 3x^{\frac{1}{3}}$  near  $a = 1$  is

- (a)  $1 + 3x$ , (b)  $4 + x$ , (c)  $1 - x$ , (d)  $3 + x$

Q.6. If  $A = \pi r^2$ , and the rate of increase of A is  $\frac{dA}{dt} = 4\pi$  cm/sec, then the rate of increase of radius r

at  $r = 1$  cm is

- (a) 1 cm/sec, (b)  $2\pi$  cm/sec, (c) 2 cm/sec, (d) None of these.

Q.7. The critical numbers of  $f(x) = \frac{1}{\sqrt{1-x^2}}$  are

- (a) 0, (b) -1, 1 (c) -1, 0, 1 (d) None of these.

Q.8. The absolute maxima of  $f(x) = x^2 - 4x$  on  $[1, 3]$  is

- (a) 2, (b) 0, (c) 1, (d) -3.

Q.9.  $f(x) = x^4 - 8x^2 + 1$  has local extrema at

- (a)  $x = 1$ , (b)  $x = -2$ , (c)  $x = 4$ , (d)  $x = -1$ .

Q.10. If  $f(x)$  has a critical number  $x = -1$  and  $f''(-1) = -42$ , then at  $x = -1$

- (a)  $f(x)$  has local minima, (b)  $f(x)$  has local maxima, (c)  $f(x)$  has a point of inflection, (d) None of these.

Q.11. Use implicit differentiation to find  $\frac{dy}{dx}$  if the curve given by the equation  $x^2 + y^2 = \frac{y^2}{x^2}$ . [4]

Q.12 Find  $\Delta y$  and  $dy$  for  $y = x^2 - x + 1$ . Also find values of  $\Delta y$  and  $dy$  for  $x = 2$  and  $\Delta x = 0.01$ . [5]

Q.13 Verify that the conditions of Mean Value theorem are satisfied for the  $f(x) = \sqrt{x+1}$  on  $[-1,0]$ , also find all values of  $c$  that satisfy the conclusion of the theorem. [5]

Q.14 Let  $f(x) = \frac{x^4}{4} - 2x^2$ , use second derivative test to find local extrema, discuss concavity and find all points of inflection, sketch the graph. [7]

Q.15 Air is being pumped inside a spherical balloon at a rate of  $16 \text{ ft}^3/\text{min}$ . At what rate is the radius changing when radius is 24 inches. [4]