

# ASSIGNMENT-1

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9) The slope of tangent to curve  $y=f(x)$  at  $[x, f(x)]$  is  $2x+1$ . If the curve passes through the point  $(1, 2)$ , then the area bounded by curve, the  $x$  axis and the line  $x = 1$  is (1995S)

a)  $\frac{5}{6}$

b)  $\frac{6}{5}$

c)  $\frac{1}{6}$

d)  $\frac{6}{1}$

10) If  $f(x) = \frac{x}{\sin x}$  and  $g(x) = \frac{x}{\tan x}$ , where  $0 < x \leq 1$ , then in this interval (1997 – 2Marks)

a) both  $f(x)$  and  $g(x)$  are increasing functions.

b) both  $f(x)$  and  $g(x)$  are decreasing functions.

c)  $f(x)$  is an increasing function.

d)  $g(x)$  is an increasing function.

11) The function  $f(x) = \sin^4 x + \cos^4 x$  increases if

(1999 – 2Marks)

a)  $0 < x < \frac{\pi}{8}$

c)  $\frac{3\pi}{8} < x < \frac{5\pi}{8}$

b)  $\frac{\pi}{4} < x < \frac{3\pi}{8}$

d)  $\frac{5\pi}{8} < x < \frac{3\pi}{4}$

12) Consider the following statements in S and R

(2000S)

S: Both  $\sin x$  and  $\cos x$  are decreasing functions in the interval  $\left(\frac{\pi}{2}, \pi\right)$

R: If a differentiable function decreases in a interval  $(a, b)$ , then its derivative also decreases in  $(a, b)$ .

Which of the following is true ?

a) Both S and R are wrong.

b) Both S and R are correct, but R is not the correct explanation of S.

c) S is correct and R is correct explanation for S.

d) S is correct and R is wrong.

13) Let  $f(x) = \int e^x(x-1)(x-2)dx$ . Then  $f$  decreases in the interval

(2000S)

- a)  $(-\infty, -2)$                       c)  $(1, 2)$   
 b)  $(-2, -1)$                       d)  $(2, +\infty)$

14) If normal to curve  $y = f(x)$  at the point  $(3, 4)$  makes an angle  $\frac{3\pi}{4}$  with the positive  $x$ -axis, then  $f'(3) =$  (2000S)

- a)  $-1$                                       c)  $\frac{4}{3}$   
 b)  $-\frac{3}{4}$                                       d)  $1$

15) Let  $f(x) = \begin{cases} |x|, & \text{for } 0 < |x| \leq 2 \\ 1, & \text{for } x = 0 \end{cases}$  then at  $x = 0$ ,  $f$  has (2000S)

- a) a local maximum  
 b) no local maximum  
 c) a local minimum  
 d) no extremum

16) For all  $x \in (0, 1)$  (2000S)

- a)  $e^x < 1 + x$   
 b)  $\log_e(1 + x) < x$   
 c)  $\sin x > x$   
 d)  $\log_e x > x$

17) If  $f(x) = xe^{x(1-x)}$ , then  $f(x)$  is (2001S)

- a) increasing on  $\left[-\frac{1}{2}, 1\right]$   
 b) decreasing on  $\mathbb{R}$   
 c) increasing on  $\mathbb{R}$   
 d) decreasing on  $\left[-\frac{1}{2}, 1\right]$

18) The triangle formed by tangent to curve  $f(x) = x^2 + bx - b$  at the point  $(1, 1)$  and the coordinate axes, lies in the first quadrant. If its area is 2, then the value of  $b$  is (2001S)

- a)  $-1$                                       c)  $-3$   
 b)  $3$                                         d)  $1$

19) Let  $f(x) = (1 + b^2)x^2 + 2bx + 1$  and let  $m(b)$  be the minimum value of  $f(x)$ . As  $b$  varies, the range of  $m(b)$  is (2001S)

- a)  $[0, 1]$                       b)  $\left(0, \frac{1}{2}\right]$                       c)  $\left[\frac{1}{2}, 1\right]$                       d)  $(0, 1]$

20) The length of a longest interval in which the function  $3 \sin x - 4 \sin^3 x$  is increasing, is (2002S)

- a)  $\frac{\pi}{3}$     c)  $\frac{3\pi}{2}$   
 b)  $\frac{\pi}{2}$     d)  $\pi$

21) The point(s) on the curve  $y^3 + 3x^2 = 12y$  where the tangent is vertical, is(are) (2002S)

- a)  $\left(\pm \frac{4}{\sqrt{3}}, -2\right)$     c)  $(0, 0)$   
 b)  $\left(\pm \sqrt{\frac{11}{3}}, 1\right)$     d)  $\left(\pm \frac{4}{\sqrt{3}}, 2\right)$

22) In  $[0, 1]$  Lagranges Mean Value theorem is NOT applicable to (2003S)

- a)  $f(x) = \begin{cases} \frac{1}{2} - x, & x < \frac{1}{2} \\ \left(\frac{1}{2} - x\right)^2, & x \geq \frac{1}{2} \end{cases}$   
 b)  $f(x) = \begin{cases} \frac{\sin x}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$   
 c)  $f(x) = x|x|$   
 d)  $f(x) = |x|$

23) Tangent is drawn to ellipse  $\frac{x^2}{27} + y^2 = 1$  at  $(3\sqrt{3} \cos \theta, \sin \theta)$  (where  $\theta \in (0, \frac{\pi}{2})$ ). Then the value of  $\theta$  such that sum of intercepts on axes made by this tangent is minimum, is (2003S)

- a)  $\frac{\pi}{3}$                       b)  $\frac{\pi}{6}$                       c)  $\frac{\pi}{8}$                       d)  $\frac{\pi}{4}$