ASSIGNMENT-1

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I. MCQ with One Correct Answer

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

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

3) The function $f(x)=\sin^4 x+\cos^4 x$ increases if (1999-2 Marks)
   a) $0<x<\frac{\pi}{8}$
   b) $\frac{\pi}{4}<x<\frac{3\pi}{8}$
   c) $\frac{3\pi}{8}<x<\frac{5\pi}{8}$
   d) $\frac{5\pi}{8}<x<\frac{3\pi}{4}$

4) 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.

5) Let $f(x) = \int e^x(x-1)(x-2)dx$. Then f decreases in the interval (2000S)
   a) $(-\infty,-2)$
   b) $(-2,-1)$
   c) $(1,2)$
   d) $(2,+\infty)$

6) 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
   b) -$\frac{3}{4}$
   c) $\frac{4}{3}$
   d) 1

7) 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

8) For all $x\in(0,1)$ (2000S)
   a) $e^x<1+x$
   b) $\log_e(1+x)<x$
   c) $\sin x>x$
   d) $\log_e x>x$

9) If $f(x)=xe^{x(1-x)}$,then $f(x)$ is (2001S)
   a) increasing on $\left[-\frac{1}{2},1\right]$
   b) decreasing on R

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

10) 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
b) 3
c) -3
d) 1

11) 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) $(0, 1]$

12) The length of a longest interval in which the function $3\sin x - 4\sin^3 x$ is increasing, is (2002S)
a) $\frac{\pi}{3}$
b) $\frac{\pi}{2}$
c) $\frac{3\pi}{2}$
d) π

13) The point(s) on the curve $y^3 + 3x^2 = 12y$ where the tangent is vertical, is(are) (2002S)
a) $\left(\pm\frac{4}{\sqrt{3}}, -2\right)$
b) $\left(\pm\sqrt{\frac{11}{3}}, 1\right)$
c) $(0, 0)$
d) $\left(\pm\frac{4}{\sqrt{3}}, 2\right)$

14) 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) $f(x) = |x|$

15) 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 θ 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) $\frac{\pi}{4}$