Assignment(matrix theory)

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A Fill in the blanks

1) The larger of $\cos(\ln\theta)$ and $\ln(\cos\theta)$ if $e^{\frac{-\pi}{2}} < \theta < \frac{\pi}{2}$ is ..... $(1983 - 1Mark)$

2) The function
$$y = 2x^2 - \ln|x|$$
is monotonically increasing for values of $x(\neq 0)$ satisfying the inequalities ..... and monotonically decreasing for values of x satisfying the inequalities ..... $(1983 - 2Marks)$

3) The set of all x for which
$$\ln(1+x) \leq x$$
is equal to ..... $(1987 - 2Marks)$

4) Let P be a variable point on the ellipse
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$
with foci F_1 and F_2. If A is the area of the triangle PF_1F_2 then the maximum value of A is ..... $(1994 - 2Marks)$

5) Let C be the curve
$$y^3 - 3xy + 2 = 0.$$
If H is the set of points on the curve C where the tangent is horizontal and V is the set of the point on the curve C where the tangent is vertical then H = ... and V = ... $(1994 - 2Marks)$

B True / False

1) If $x - r$ is a factor of the polynomial
$$f(x) = a_n x^4 + ... + a_0$$
, repeated m times $(1 < m \leq n)$, then r is a root of $f'(x) = 0$ repeated m times. $(1983 - 1Mark)$

2) For $0 < a < x$, the minimum value of the function $log_a x + log_x a$ is 2. $(1984 - 1Mark)$

C MCQs with One Correct Answer

1) If $a + b + c = 0$, then the quadratic equation
$$3ax^2 + 2bx + c = 0$$
has $(1983 - 1Mark)$
   a) at least one root in [0,1]
   b) one root in [2,3] and other in [-2,-1]
   c) imaginary roots
   d) none of these

2) AB is a diameter of a circle and C is any point on the circumference of the circle. Then $(1983 - 1Mark)$
   a) the area ofΔ ABC is maximum when it is isosceles
   b) the area of Δ ABC is minimum when it is isosceles
   c) the perimeter of Δ ABC is minimumwhen it is isosceles
   d) none of these

3) The normal to the curve
$$x = a(\cos\theta + \theta\sin\theta)$$
,
$$y = a(\sin\theta - \theta\cos\theta)$$
at any point 'θ' is such that $(1983 - 1Mark)$
   a) it makes constant angle with the x - axis
   b) it passes through the origin
   c) it is at a constant distance from the origin
   d) none of these

4) If
$$y = a\ln x + bx^2 + x$$

has its extremum values at $x = -1$ and $x = 2$, then (1983 – 1*Mark*)

a) $a = 2,\ b = -1$
b) $a = 2,\ \mathrm{b} = \frac{-1}{2}$
c) $a = -2,\ \mathrm{b} = \frac{1}{2}$
d) none of these

5) Which one of the following curves cut the parabola $y^2 = 4ax$ at right angles? (1994)

a) $x^2 + y^2 = a^2$
b) $e^{\frac{-x}{2a}}$
c) $y = ax$
d) $x^2 = 4ay$

6) The function defined by

$$f(x) = (x + 2)\, e^{-x}$$

is

(1994)

a) decreasing for all x
b) decreasing in $(-\infty, -1)$ and increasing in $(-1, \infty)$
c) increasing for all x
d) decreasing in $(-1, \infty)$ and increasing in $(-\infty, -1)$

7) The function

$$f(x) = \frac{\ln(\pi + x)}{\ln(e + x)}$$

is

(1995*S*)

a) increasing on $(0, \infty)$
b) decreasing on $(0, \infty)$
c) increasing on $\left(0, \frac{\pi}{e}\right)$, decreasing on

$$\left(\frac{\pi}{e}, \infty\right)$$

d) decreasing on $\left(0, \frac{\pi}{e}\right)$, increasing on

$$\left(\frac{\pi}{e}, \infty\right)$$

8) On the interval [0, 1] the function

$$x^{25}\,(1 - x)^{25}$$

takes its maximum value at the point (1995*S*)

1) 0 2) $\frac{1}{4}$ 3) $\frac{1}{2}$ 4) $\frac{1}{3}$