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

B True / False

1. If x-r is a factor of the polynomial f(x) = a_nx^4+....+a_0, repeated m times ($1 < m \leq n$), then r is a root of f'(x)=0 repeated m times. (1983 - 1 Mark)
2. For $0 < a < x$, the minimum value of the function $log_a x + log_x a$ is 2. (1984 - 1 Mark)

C MCQs with One Correct Answer

1. If a+b+c = 0, then the quadratic equation $3ax^2$ + 2bx + c = 0 has (1983 - 1 Mark)
   (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 - 1 Mark)
   (a) the area of Δ 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 minimum when 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 - 1 Mark)
   (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, b = $\frac{-1}{2}$
   (c) a = -2, 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 (1995S)
   (a) increasing on $(0, \infty)$
   (b) decreasing on $(0, \infty)$
   (c) increasing on $(0, \frac{\pi}{e})$, decreasing on $(\frac{\pi}{e}, \infty)$
   (d) decreasing on $(0, \frac{\pi}{e})$, increasing on $(\frac{\pi}{e}, \infty)$
8. On the interval [0, 1] the function $x^{25}(1 - x)^{25}$ takes its maximum value at the point (1995S)
   (a) 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{3}$