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 $(1983-1Mark)$
   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 $f(x) = \dfrac{\ln(\pi + x)}{\ln(e + x)}$ is (1995*S*)

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

8) On the interval [0, 1] the function $x^{25}(1 - x)^{25}$ takes its maximum value at the point (1995*S*)

a. 0 b. $\dfrac{1}{4}$ c. $\dfrac{1}{2}$ d. $\dfrac{1}{3}$