1. The order and degree of the differential equation of the family of parabolas having vertex at origin and axis along positive x-axis is

   (a) $1, 1$

   (b) $1, 2$

   (c) $2, 1$

   (d) $2, 2$

2. If $y = \log x$, then $\frac{d^2y}{dx^2} =$ _____.

3. If $y = e^x + e^{-x}$, then show that $\frac{dy}{dx} = \sqrt{y^2 - 4}$.

4. If $y = x^{\sin x} + \sin^{-1}(\sqrt{x})$, the find $\frac{dy}{dx}$.

5. Find the intervals in which the function f defined as $f(x) = \sin(x) + \cos(x)$, $0 \leq x \leq 2\pi$ is strictly increasing or decreasing.

6. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.