DIFFERENTIATION

1. The point at which the normal to the curve $y = x + \frac{1}{x}, X > 0$ is perpendicular to the line $3x - 4y7 = 0$ is:

   (a) $(2, \frac{5}{2})$
   (b) $(\pm 2, \frac{5}{2})$
   (c) $(-\frac{1}{2}, \frac{5}{2})$
   (d) $(\frac{1}{2}, \frac{5}{2})$

2. If $y = log(\cos e^x)$, then $\frac{dx}{dy}$ is:

   (a) $\cos e^{x-1}$
   (b) $e^{-x} \cos e^x$
   (c) $e^x \sin e^x$
   (d) $-e^x \tan e^x$

3. The least value of the function $f(x) = 2\cos x + x$ in the closed interval $[0, \frac{\pi}{2}]$ is:

   (a) 2
   (b) $\frac{\pi}{6} + \sqrt{3}$
   (c) $\frac{\pi}{2}$
   (d) The least value does not exist.

4. If $x = a\sec\theta, y = b\tan\theta$, then $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$ is:

   (a) $\frac{-3\sqrt{3}b}{a^2}$
   (b) $\frac{-2\sqrt{3}b}{a}$
   (c) $\frac{-3\sqrt{3}b}{a}$
   (d) $\frac{-b}{3\sqrt{3}a^2}$

5. The derivative of $\sin^{-1}(2x\sqrt{1-x^2})$ w.r.t $\sin^{-1} x, -\frac{1}{\sqrt{2}} < x < \frac{1}{\sqrt{2}}$, is:

   (a) 2
   (b) $\frac{\pi}{2} - 2$
   (c) $\frac{\pi}{2}$
   (d) -2

6. The point(s) on the curve $y = x^3 - 11x + 5$ at which the tangent is $y = x - 11$ is/are:

   (a) $(-2, 19)$
   (b) $(2, -9)$
   (c) $(\pm 2, 19)$
   (d) $(-2, 19) and (2, -9)$

7. For which value of m is the line $y = mx+1$ a tangent to the curve $y^2 = 4x$?

   (a) $\frac{1}{2}$
   (b) 1
   (c) 2
   (d) 3

8. The maximum value of $[x(x-1)+1]^{\frac{1}{3}}, 0 \leq x \leq 1$ is:

   (a) 0
   (b) $\frac{1}{2}$
   (c) 1
   (d) $\sqrt{3}\frac{1}{3}$