1. Water is dripping out from a conical funnel of semi-vertical angle $\frac{\pi}{4}$ at the uniform rate of $2\ \text{cm}^3/\text{s}$ in the surface area, through a tiny hole at the vertex of the bottom. When the slant height of cone is 4 cm, find the rate of decrease of the slant height of water, is

(1) $\frac{\sqrt{2}}{4\pi}\ \text{cm/s}$ (2) $\frac{1}{4\pi}\ \text{cm/s}$

(3) $\frac{1}{\pi\sqrt{2}}\ \text{cm/s}$ (4) $\frac{1}{3\pi\sqrt{2}}\ \text{cm/s}$

2. The radius of a right circular cylinder increases at the rate of $0.1\,cm/$ min, and the height decreases at the rate of $0.2\,cm/$ min. The rate of change of the volume of the cylinder, in $cm^3/$ min, when the radius is $2\,cm$ and the height is $3\,cm$ is

(1) -2π (2) $-\frac{8\pi}{5}$

(3) $-\frac{3\pi}{5}$ (4) $\frac{2\pi}{5}$

3. The distance travelled s(in meteres) by a particle in t second is given by, $s = t^3 + 2t^2 + t$.The speed of the particle after 1sec will be

(1) 8 cm/s (2) 6 cm/s

(3) 2 cm/s (4) None of these

4. If the ratio of base radius and height of a cone is $1:2$ and percentage error in radius is $\lambda\%$, then the error in its volume is

(1) $\lambda\%$ (2) $2\lambda\%$

(3) $3\lambda\%$ (4) $4\lambda\%$

(5) none of these.

5. The value of k in order that $f(x) = \sin x - \cos x - kx + b$ decreases for all real values is given by :

(1) $k < 1$ (2) $k > 1$

(3) $k > \sqrt{2}$ (4) $k < \sqrt{2}$

6. if what values of x, the function $f(x) = x^4 - 4x^3 + 4x^2 + 40$ is monotonic decreasing. Then the solution set of x is

(1) $0 < x < 1$ (2) $1 < x < 2$

(3) $2 < x < 3$ (4) $4 < x < 5$

7. In which interval the function $y = x - \cot^{-1} x - \log\left(x + \sqrt{x^2+1}\right)$ is increasing :

(1) $(-\infty, 0)$ (2) $(-\infty, \infty)$

(3) $(0, \infty)$ (4) $R - \{0\}$

8. Let $f(x) = e^x - x$ and $g(x) = x^2 - x$, $\forall\ x \in R$. Then the set of all $x \in R$, where the function $h(x) = (fog)(x)$ is increasing, is:

(1) $\left[-1, -\frac{1}{2}\right] \cup \left[\frac{1}{2}, \infty\right)$ (2) $[0, \infty)$

(3) $\left[0, \frac{1}{2}\right] \cup \left[1, \infty\right)$ (4) $\left[-\frac{1}{2}, 0\right] \cup \left[1, \infty\right)$

9. If $f(x) = xe^{x(1-x)}$, then $f(x)$ is:

(1) Increasing on $\left[-\frac{1}{2}, 1\right]$ (2) Decreasing on R

(3) Increasing on R (4) Decreasing on $\left[-\frac{1}{2}, 1\right]$

10. The value of k in order that $f(x) = \sin x - \cos x - kx + b$ decreases for all real values is given by :

(1) $k < 1$ (2) $k > 1$

(3) $k > \sqrt{2}$ (4) $k < \sqrt{2}$