EXERCISE – II MULTIPLE CORRECT (OBJECTIVE QUESTIONS)

1. Which of the following statements is/are correct
(A) x + sin x is increasing function
(B) sec x is neither increasing nor decreasing function
(C) x + sin x is decreasing function
(D) sec x is an increasing function

2. The function $f(x) = 2\,ln\,(x - 2) - x^2 + 4x + 1$ increases in the intervals

(A) (1, 2) (B) (2, 3) (C) $\left[\frac{5}{2}, 3\right]$ (D) (2, 4)

3. If $f(x) = 2x + \cot^{-1} x + \log\left(\sqrt{1+x^2} - x\right)$, then f(x)
(A) increases in $[0, \infty)$ (B) decreases in $[0, \infty)$
(C) neither increases nor decreases in $[0, \infty)$
(D) increases in $(-\infty, \infty)$

4. Let $g(x) = 2f(x/2) + f(1 - x)$ and $f''(x) < 0$ in $0 \le x \le 1$ then g(x)

(A) decreases in $\left[0, \frac{2}{3}\right]$ (B) decreases $\left[\frac{2}{3}, 1\right]$

(C) increases in $\left[0, \frac{2}{3}\right]$ (D) increases in $\left[\frac{2}{3}, 1\right]$

5. Let the function f(x) = sin x + cos x, be defined in $[0, 2\pi]$, then f(x)
(A) increases in $(\pi/4, \pi/2)$
(B) decreases in $[\pi/4, 5\pi/4]$
(C) increases in $[0, \pi/4] \cup [5\pi/4, 2\pi]$
(D) decreases in $[0, \pi/4) \cup (\pi/2, 2\pi]$

6. If $f(x) = \tan^{-1}x - (1/2)\,ln\,x$ then
(A) the greatest value of f(x) on $[1/\sqrt{3}, \sqrt{3}]$ is $\pi/6 + (1/4)\,ln\,3$
(B) the least value of f(x) on $[1/\sqrt{3}, \sqrt{3}]$ is $\pi/3 - (1/4)\,ln\,3$
(C) f(x) decreases on $(0, \infty)$
(D) f(x) increases on $(-\infty, 0)$

7. If f(x) = log (x – 2) – 1/x , then
(A) f(x) is M.I. for $x \in (2, \infty)$
(B) f(x) is M.I. for $x \in [-1, 2]$
(C) f(x) is always concave downwards
(D) $f^{-1}(x)$ is M.I. wherever defined

8. Which of the following functions do not satisfy conditions of Rolle's Theorem ?

(A) $e^x \sin x,\ x \in \left[0, \frac{\pi}{2}\right]$

(B) $(x + 1)^2 (2x - 3)^5,\ x \in \left[-1, \frac{3}{2}\right]$

(C) $\sin |x|,\ x \in [\pi, 2\pi]$ (D) $\sin \frac{1}{x},\ x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

9. Let $f(x) = x^{m/n}$ for $x \in R$ where m and n are integers, m even and n odd and $0 < m < n$. Then
(A) f(x) decreases on $(-\infty, 0]$
(B) f(x) increases on $[0, \infty)$
(C) f(x) increases on $(-\infty, 0]$
(D) f(x) decreases on $[0, \infty)$

10. Let f and g be two functions defined on an interval I such that $f(x) \ge 0$ and $f(x) \le 0$ for all $x \in I$ and f is strictly decreasing on I while g is strictly increasing on I then
(A) the product function fg is strictly increasing on I
(B) the product function fg is strictly decreasing on I
(C) fog(x) is monotonically increasing on I
(D) fog(x) is monotonically decreasing on I

11. The function $y = 2x^2 - ln\,|x|$ is monotonically increasing in the interval I_1 and monotonically decreasing in the interval I_2, $x\ (\neq 0)$, then

(A) $I_1 = \left(-\frac{1}{2}, 0\right) \cup \left(\frac{1}{2}, \infty\right)$ (B) $I_2 = \left(-\infty, -\frac{1}{2}\right) \cup \left(0, \frac{1}{2}\right)$

(C) $I_1 = \left(-\infty, -\frac{1}{2}\right) \cup \left(0, \frac{1}{2}\right)$ (D) $I_2 = \left(-\frac{1}{2}, 0\right) \cup \left(\frac{1}{2}, \infty\right)$

12. Let $\phi(x) = f(x)^3 - 3(f(x))^2 + 4f(x) + 5x + 3 \sin x + 4 \cos x\ \forall\ x \in R$, then
(A) ϕ is increasing whenever f is increasing
(B) ϕ is increasing whenever f is decreasing
(C) ϕ is decreasing whenever f is decreasing
(D) ϕ is decreasing if $f'(x) = -11$

13. If $\phi(x)=f(x) + f(2a - x)$ and $f''(x)>a$, $a>0$, $0\le x\le 2a$, then

(A) $\phi(x)$ increases in (a, 2a)

(B) $\phi(x)$ increases in (0, a)

(C) f(x) decreases in (0, a)

(D) $\phi(x)$ decreases in (1, 2a)

14. For the function $f(x) = x^4 (12 \ln x - 7)$

(A) the point (1, –7) is the point of inflection

(B) $x = e^{1/3}$ is the point of minima

(C) the graph is concave downwards in (0, 1)

(D) the graph is concave upwards in $(1, \infty)$

15. The function $f(x) = 3x^4 + 4x^3 - 12x^2 - 7$ is

(A) $\uparrow$ in $[-2, 0]$ & $[1, \infty)$ (B) $\downarrow$ in $(-\infty, -2]$ & $[0, 1]$

(C) $\downarrow$ in $[-2, 0]$ & $[1, \infty)$ (D) $\downarrow$ in $(-\infty, -2]$ & $[0, 1]$

16. The function $f(x) = x^2/(x - 1)$, $x \neq 1$ is

(A) $\uparrow$ $[0, 1) \cup (1, 2]$ (B) $\downarrow$ In $(-\infty, 0] \cup [2, \infty)$

(C) $\downarrow$ $[0, 1) \cup (1, 2]$ (D) $\uparrow$ In $(-\infty, 0] \cup [2, \infty)$

17. If p, q, r be real then the intervals in which,

$$f(x) = \begin{vmatrix} x+p^2 & pq & pr \\ pq & x+q^2 & qr \\ pr & qr & x+r^2 \end{vmatrix}$$

(A) increases is $x < -\dfrac{2}{3}(p^2 + q^2 + r^2)$, $x > 0$

(B) decrease is $\left(-\dfrac{2}{3}(p^2 + q^2 + r^2), 0\right)$

(C) decrease is $x < -\dfrac{2}{3}(p^2 + q^2 + r^2)$, $x > 0$

(D) increase is $\left(-\dfrac{2}{3}(p^2 + q^2 + r^2), 0\right)$

18. Which of the following inequalities are valid

(A) $|\tan^{-1} x - \tan^{-1} y| \le |x - y| \ \forall\ x, y \in R$

(B) $|\tan^{-1} x - \tan^{-1} y| \ge |x - y|$

(C) $|\sin x - \sin y| \le |x - y|$ (D) $|\sin x - \sin y| \ge |x - y|$