

APPLICATION OF DERIVATIVE
INCREASING AND DECREASING FUNCTIONS
Multiple Choice Questions [MCQ]

1. If I be an open interval contained in the domain of a real valued function f and if $x_1 < x_2$ in I , then which of the following statements is true?
 - (a) f is said to be increasing on I , if $f(x_1) \leq f(x_2)$ for all $x_1, x_2 \in I$
 - (b) f is said to be strictly increasing on I , if $f(x_1) < f(x_2)$ for all $x_1, x_2 \in I$
 - (c) Both (a) and (b) are true
 - (d) Both (a) and (b) are false
2. The function given by $f(x) = \cos x$ is
 - (a) strictly decreasing in $(0, \pi)$
 - (b) strictly increasing in $(\pi, 2\pi)$,
 - (c) neither increasing nor decreasing in $(0, 2\pi)$.
 - (d) none of the above
3. The function $f(x) = 4x + 3, x \in \mathbf{R}$ is an
 - (a) increasing function
 - (b) decreasing function
 - (c) neither increasing nor decreasing
 - (d) none of the above
4. Function f given by $f(x) = x^2 - x + 1$ is
 - (a) strictly decreasing in $(-1, 1)$.
 - (b) strictly increasing in $(-1, 1)$.
 - (c) neither increasing nor decreasing in $(-1, 1)$.
 - (d) none of the above
5. The least value of a such that the function f given by $f(x) = x^2 + ax + 1$ is strictly increasing on $(1, 2)$ is
 - (a) $a = -3$
 - (b) $a = -2$
 - (c) $a = -2$
 - (d) $a = 3$
6. The function given by $f(x) = x^3 - 3x^2 + 3x - 100$ is
 - (a) increasing in \mathbf{R} .
 - (b) decreasing in \mathbf{R}
 - (c) neither increasing nor decreasing in \mathbf{R}
 - (d) none of the above
7. The function $f(x) = \tan x - 4x$ is
 - (a) strictly increasing on $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$
 - (b) strictly decreasing on $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$
 - (c) neither increasing nor decreasing on $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$
 - (d) none of the above
8. The interval in which $y = x^2 e^{-x}$ is increasing is
 - (a) $(-\infty, \infty)$
 - (b) $(-2, 0)$
 - (c) $(2, \infty)$
 - (d) $(0, 2)$
9. The function $f(x) = \log(\cos x)$ is
 - (a) strictly increasing on $\left(0, \frac{\pi}{2}\right)$
 - (b) strictly decreasing on $\left(0, \frac{\pi}{2}\right)$
 - (c) neither increasing nor decreasing on $\left(0, \frac{\pi}{2}\right)$
 - (d) none of the above
10. The interval for which the function $f(x) = \cot^{-1} x + x$ increases is
 - (a) $\left(0, \frac{\pi}{2}\right)$
 - (b) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
 - (c) $(0, \pi)$
 - (d) $(-\infty, \infty)$
11. For which values of x , the function $y = x^4 - \frac{4x^3}{3}$ is increasing and for which values, it is decreasing.

- (a) increasing in $(-\infty, 1]$ and decreasing in $[1, \infty)$ (b) increasing in $[1, \infty)$ and decreasing in $(-\infty, 1]$
 (c) increasing in $[2, \infty)$ and decreasing in $(-\infty, 2]$ (d) None of these
- 12.** The interval on which the function $f(x) = 2x^3 + 9x^2 + 12x - 1$ is decreasing is
 (a) $[-1, \infty]$ (b) $[-2, -1]$
 (c) $[-\infty, -2]$ (d) $[-1, 1]$
- 13.** The values of x for which the function $f(x) = 2 + 3x - x^3$ is decreasing is
 (a) $x \leq -2$ or $x \geq 2$ (b) $x \leq 0$ or $x \geq 1$
 (c) $x \leq -1$ or $x \geq 1$ (d) none of these
- 14.** The function $f(x) = 4x^3 - 18x^2 + 27x - 7$ is
 (a) always decreasing in \mathbb{R} . (b) neither increasing nor decreasing in \mathbb{R} .
 (c) always increasing in \mathbb{R} . (d) none of these
- 15.** The function f given by $f(x) = \tan^{-1}(\sin x + \cos x)$ is
 (a) increasing for all $x \in (\pi/4, \pi/2)$ (b) decreasing for all $x \in (\pi/4, \pi/2)$
 (c) neither increasing nor decreasing for $x \in (\pi/4, \pi/2)$ (d) none of these

ANSWERS

Q. No.	1	2	3	4	5	6	7	8	9	10
Answer	(c)	(d)	(a)	(c)	(b)	(a)	(b)	(d)	(b)	(d)
Q. No.	11	12	13	14	15					
Answer	(b)	(b)	(c)	(c)	(b)					

MAXIMA & MINIMA **Multiple Choice Questions [MCQ]**

- 1.** f be a function defined on an interval I . Then, which of the following is incorrect ?
 (a) f is said to have a maximum value in I , if $\exists c$ in I such that $f(c) \geq f(x)$, $\forall x \in I$.
 (b) f is said to have a minimum value in I , if $\exists c$ in I such that $f(c) \leq f(x)$, $\forall x \in I$.
 (c) f is said to have an extreme value in I , if $\exists t$ in I such that $f(c)$ is either a maximum or a minimum value of f in I .
 (d) none of these
- 2.** The maximum and minimum values of the function $f(x) = (2x - 1)^2 + 7$ are
 (a) minimum Value = 5, no maximum (b) minimum Value = 7, no maximum
 (c) no maximum Value = 3, maximum=1 (d) neither minimum nor maximum
- 3.** The maximum and minimum values of the function $f(x) = 9x^2 + 12x + 2$ are
 (a) minimum Value = 23, no maximum (b) minimum Value = -2, no maximum
 (c) maximum Value = -2, no Minimum (d) neither minimum nor maximum
- 4.** The maximum and minimum values of the function $f(x) = -(x - 1)^2 + 10$ are
 (a) minimum Value = 5, no maximum (b) maximum Value = 10, maximum=1
 (c) maximum Value = 10, no minimum (d) neither minimum nor maximum
- 5.** The maximum and minimum values of the function $f(x) = |\sin 4x + 3|$ are
 (a) Minimum = 3 ; Maximum = 4 (b) Minimum = 0; Maximum = 4
 (c) Minimum = 2; Maximum = 4 (d) none of these
- 6.** The local maxima and local minima for $f(x) = x^3 - 3x$ are
 (a) local minimum at $x = 1$ is -2, local maximum at $x = -1$, is 2
 (b) local minimum at $x = 1$ is 2, local maximum at $x = -1$, is 3
 (c) local minimum at $x = 1$ is -2, no local maximum
 (d) none of these

7. The local maxima and local minima for $f(x) = x^3 - 6x^2 + 9x + 15$ are

- (a) local minimum at $x = 3$ is 15, local maximum at $x = 1$, is 19
- (b) local minimum at $x = 1$ is 2, local maximum at $x = 3$, is 3
- (c) local minimum at $x = 1$ is -2 and no local maximum
- (d) none of these

8. The absolute maximum value and the absolute minimum value of $f(x) = \sin x + \cos x$, $x \in [0, \pi]$

- (a) Absolute minimum value = 1, absolute maximum value = $\sqrt{2}$
- (b) Absolute minimum value = -1 , absolute maximum value = $\sqrt{2}$
- (c) Absolute minimum value = -1 , absolute maximum value = 2
- (d) none of these

9. The absolute maximum value and the absolute minimum value of $f(x) = (x - 1)^2 + 3$, $x \in [-3, 1]$

- (a) Absolute minimum value = 1, absolute maximum value = 19
- (b) Absolute minimum value = 1, absolute maximum value = $\sqrt{2}$
- (c) Absolute minimum value = -1 , absolute maximum value = 19
- (d) None of these

10. The minimum and maximum value of the function $\sin x + \cos x$ is

- (a) Minimum = 0, maximum = $\sqrt{2}$
- (b) Minimum = $-\sqrt{2}$, maximum = $\sqrt{2}$
- (c) Minimum = $-\sqrt{2}$, maximum = 0
- (d) None of these

ANSWERS

Q. No.	1	2	3	4	5	6	7	8	9	10
Answer	(d)	(b)	(b)	(c)	(c)	(a)	(a)	(b)	(a)	(b)