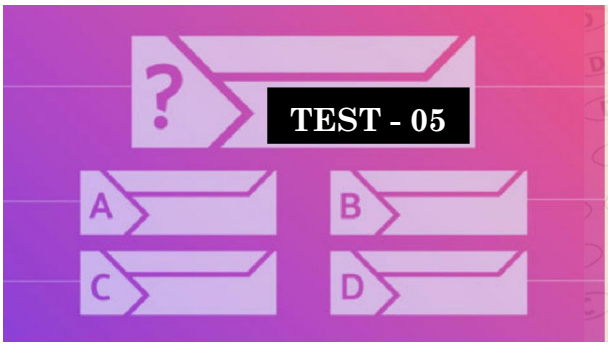

By O.P. GUPTA

MULTIPLE CHOICE TYPE QUESTIONS

For CBSE 2025 Exams - Mathematics (041) - Class 12

Topics : Applications Of Derivatives **Max. Marks : 30**

☑ ***Select the correct option in the followings. Each question carries 1 mark.***

Q01. An angle θ, $0 < \theta < \frac{\pi}{2}$ which increases twice as fast as its sine, is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

Q02. Exponential function, $f(x) = e^x$ is

(a) always increasing (b) always decreasing

(c) both increasing and decreasing (d) neither increasing nor decreasing

Q03. The function $\cos 3x$ is

(a) increasing on $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$ (b) decreasing on $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

(c) decreasing on $\left(0, \frac{\pi}{3}\right)$ (d) Both (a) and (c)

Q04. $f(x) = \frac{e^{2x} - 1}{e^{2x} + 1}$ is

(a) always increasing (b) always decreasing

(c) both increasing and decreasing (d) None of these

Q05. The rate of change of the surface area of the sphere of radius r when the radius is increasing at the rate of 2 cm/s is proportional to

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

Q06. Maximum value of $\sin x + \sqrt{3}\cos x$ is

(a) 1 (b) 2 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

Q07. If the rate of decrease of $\frac{x^2}{2} - 2x + 5$ is twice the rate of decrease of $2x$, then x is equal to

(a) 2 (b) 4 (c) 6 (d) 8

Q08. The function $x^2 - 4x,\ x \in [0, 4]$ attains minimum value at

(a) $x = 0$ (b) $x = 2$ (c) $x = 1$ (d) $x = 4$

Q09. The sides of an equilateral triangle are increasing at the rate of 2 cm/sec. The rate at which the area increases, when side is 10 cm is

(a) 10 cm^2/s (b) $\sqrt{3}\ cm^2/s$ (c) $10\sqrt{3}\ cm^2/s$ (d) $\frac{10}{3}\ cm^2/s$

Q10. Let the function $f : R \to R$ be defined by $f(x) = 2x + \cos x$, then f

(a) has a minimum at $x = \pi$ (b) has a maximum at $x = 0$

(c) is a decreasing function (d) is an increasing function

Q11. $y = x(x-3)^2$ decreases for the values of x given by

(a) $1 < x < 3$ (b) $x < 0$ (c) $x > 0$ (d) $0 < x < \frac{3}{2}$

Q12. Which of the following functions is decreasing on $\left(0, \frac{\pi}{2}\right)$?

(a) $\sin 2x$ (b) $\tan x$ (c) $\cos x$ (d) $\cos 3x$

Q13. The function $f(x) = \tan x - x$

(a) always increases

(b) always decreases

(c) never increases

(d) sometimes increases and sometimes decreases

Q14. If x is real, the minimum value of $x^2 - 8x + 17$ is

(a) –1 (b) 0 (c) 1 (d) 2

Q15. Maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is

(a) 0 (b) 12 (c) 16 (d) 32

Q16. $f(x) = x^x$ has a stationary point at

(a) $x = e$ (b) $x = e^{-1}$ (c) $x = 1$ (d) $x = \sqrt{e}$

Q17. For what value of a, $f(x) = a(x + \sin x)$ is an increasing function?

(a) $a \le 0$ (b) $a \in (0, \infty)$ (c) $a \in [0, \infty)$ (d) $a \in (-\infty, \infty)$

Q18. The maximum value of $f(x) = \sin(\sin x)\ \forall\ x \in R$ is

(a) $\sin(1)$ (b) $-\sin(1)$ (c) $[-\sin(1), \sin(1)]$ (d) 1

Q19. Maximum and minimum values of $f(x) = x^2 + 1$ in $x \in (-2, 2)$ are, respectively

(a) 5, 0 (b) Does not exist, 0 (c) 5, Does not exist (d) Does not exist, 1

Q20. The function $f(x) = |x| - |x-1|$ is strictly increasing when

(a) $x < 0$ (b) $x > 1$ (c) $x < 1$ (d) $0 < x < 1$

Q21. The function $f(x) = x + \cot^{-1} x$ is increasing in the interval

(a) $(-\infty, \infty)$ (b) $(-1, \infty)$ (c) $(0, \infty)$ (d) $(1, \infty)$

Q22. The rate of change of the volume of sphere with respect to its surface area, when its radius is 2 units, is

(a) 1 (b) 2 (c) 3 (d) None of these

Q23. The function $f(x) = \tan^{-1} x - \log x$ decreases in

(a) $(-\infty, 0)$ (b) $\left(-\infty, \frac{1}{2}\right)$ (c) $(0, \infty)$ (d) $\left(\frac{1}{2}, \infty\right)$

Q24. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at

(a) $x = -2$ (b) $x = 0$ (c) $x = -3$ (d) $x = 2$

Q25. If $f(x) = \frac{1}{4x^2 + 2x + 1}$, then its maximum value is

(a) $\frac{2}{3}$ (b) $\frac{3}{4}$ (c) 1 (d) $\frac{4}{3}$

Q26. The maximum value of $4\sin^2 x + 3\cos^2 x$ is

(a) 3 (b) 4 (c) 5 (d) 7

Q27. The point of inflection for the curve $y = x^{5/3}$ is

(a) (0, 0) (b) (0, 1) (c) (1, 0) (d) Does not exist

*Question numbers **28** to **30** are Assertion and Reason based questions. Two statements are given, one labelled **Assertion (A)** and the other labelled **Reason (R)**. Select the correct answer from the codes (a), (b), (c) and (d) as given below.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is **not** the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

Q28. **Assertion (A) :** If $f(x) = \log x$, then $f(x)$ is always increasing in $x \in (0, \infty)$.

Reason (R) : A function $f(x)$ always increases in the interval $x \in (a, b)$, if $f'(x) > 0$ in the interval $x \in (a, b)$.

Q29. **Assertion (A) :** The maximum value of xy, if $x+2y=8$, is 8.

Reason (R) : Minimum value of $f(x)$, if $f(x)=\sin x$ in $x \in [0, 2\pi]$ is 0.

Q30. **Assertion (A) :** The least value of the function $f(x)=2x+\frac{8}{x}$, (where $x>0$) is 4.

Reason (R) : For a well defined function $y=f(x)$, $x=c$ is called the point of local minima if $f'(c)=0$ and $f''(c)>0$.

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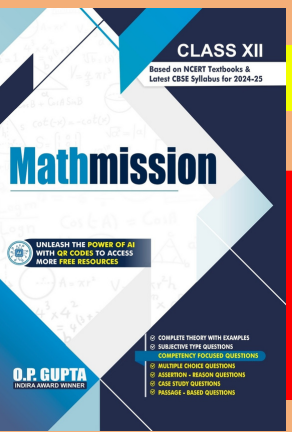

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