



a compilation by
O.P. GUPTA (Indira Award Winner)
 Useful for CBSE, CUET, JEE & NDA

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) $10 \text{ cm}^2/\text{s}$ (b) $\sqrt{3} \text{ cm}^2/\text{s}$ (c) $10\sqrt{3} \text{ cm}^2/\text{s}$ (d) $\frac{10}{3} \text{ cm}^2/\text{s}$
- Q10. Let the function $f : \mathbb{R} \rightarrow \mathbb{R}$ 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) $a \leq 0$ (b) $a \in (0, \infty)$ (c) $a \in [0, \infty)$ (d) $a \in (-\infty, \infty)$
- Q18. The maximum value of $f(x) = \sin(\sin x) \quad \forall x \in \mathbb{R}$ 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 $f''(c) > 0$.

We have released Set of 2 Books for CBSE XII (Academic session 2023-24).

1. MATHMISSION FOR XII

- ☑ COMPLETE THEORY & EXAMPLES
- ☑ SUBJECTIVE TYPE QUESTIONS
- ☑ COMPETENCY FOCUSED QUESTIONS
 - ⊛ Multiple Choice Questions
 - ⊛ Assertion-Reason Questions
 - ⊛ Case-Study Questions
 - ⊛ Passage-Based Questions

2. SOLUTIONS OF MATHMISSION

- ☑ Step-by-step Detailed Solutions (For all Exercises of MATHMISSION)

This document contains MCQs for Mathematics (041) of class XII.

★ **Answers / Solutions** shall be available on **YouTube channel** – Mathematicia By O.P. Gupta
 You can share this document with other students!

✍ *With a lot of Blessings!*

O.P. GUPTA

Author & Math Mentor
 Indira Award Winner

📖 The O.P. Gupta Advanced Math Classes
 @ **Think Academy**, Near Dhansa Bus Stand
 Metro Station Gate No.3, Najafgarh, Delhi

📞 Telegram / WhatsApp : +919650350480

📺 YouTube.com/MathematiciaByOPGupta

Exclusive coaching for Maths (041)
 By **O.P. GUPTA**

- ☑ CBSE XII
- ☑ CBSE XI
- ☑ CUET
- ☑ JEE - MAIN
- ☑ NDA