12th Board Math

Type-Wise Q-Bank

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Differential Calculus

2023 | 2024 | 2025

Type (1) : Increasing-Decreasing Q - 2025

Question 1: 2025 - Set 1 - Q22 - 2 M -

Increasing–Decreasing

Q : Find the values of a for which f(x) = $x^2 - 2ax + b$ is an increasing function for $x > 0$.

Question 2: 2025 - Set 2 - Q10 - 1 M -

Increasing–Decreasing

Q : The function $f(x) = x^2 - 4x + 6$ is increasing in the interval

(A) (0, 2) (B) $(-\infty, 2]$ (C) [1, 2] (D) $[2, \infty)$

Question 3: 2025 - Set 2 - Q21 - 2 M -

Increasing–Decreasing

Q : Find the values of a for which $f(x) = \sin x - ax + b$ is increasing on $\mathbb{R}$.

Question 4: 2025 - Set 3 - Q11 - 1 M -

Increasing–Decreasing

Q : If $f : \mathbb{R} \to \mathbb{R}$ is defined as $f(x) = 2x - \sin x$, then f is:

(A) a decreasing function

(B) an increasing function

(C) maximum at $x = \pi/2$

(D) maximum at $x = 0$

Type (1) : Increasing-Decreasing Q - 2025

Question 5: 2025 - Set 4 - Q5 - 1 M -

Increasing–Decreasing

Q : The values of λ so that f(x) = sin x − cos x − λx + C decreases for all real x are:

(A) $1 < \lambda < \sqrt{2}$ (B) $\lambda \geq 1$ (C) $\lambda \geq \sqrt{2}$ (D) $\lambda < 1$

Question 6: 2025 - Set 4 - Q13 - 1 M -

Increasing–Decreasing

Q : If f(x) = 2x + cos x, then f(x):

(A) has a maxima at x = π

(B) has a minima at x = π

(C) is an increasing function

(D) is a decreasing function

Question 7: 2025 - Set 4 - Q22(a) - 2 M -

Increasing–Decreasing

Q : Find the least value of a so that $f(x) = 2x^2 - ax + 3$ is an increasing function on [2, 4].

Question 8: 2025 - Set 4 - R22(b) - 2 M -

Increasing–Decreasing

Q : If f(x) = x + 1/x, x ≥ 1, show that f is an increasing function.

→

Type (1) : Increasing-Decreasing Q - 2025

Question 9: 2025 - Set 5 - Q26 - 3 M -

Increasing–Decreasing

Q : Show that $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in $[0, \pi/4]$.

Question 10: 2025 - Set 6 - Q23 - 2 M -

Increasing–Decreasing

Q : Determine the values of x for which $f(x) = (x - 4)/(x + 1)$, $x \neq -1$, is an increasing or a decreasing function.

Type (1) : Increasing-Decreasing Q - 2024

Question 1: 2024 - Set 1 - Q4 - 1 M -

INCREASING–DECREASING

Q : f(x) is strictly increasing on (a,b) if:

A) $f'(x) < 0$ B) $f'(x) > 0$

C) $f'(x) = 0$ D) $f(x) > 0$

Question 2: 2024 - Set 2 - Q5 - 1 M - I

Q : The function $f(x) = x^3 - 3x^2 + 12x - 18$ is:

A) strictly decreasing on $\mathbb{R}$

B) strictly increasing on $\mathbb{R}$

C) neither strictly increasing nor decreasing

D) strictly decreasing on $(-\infty, 0)$

Type (1) : Increasing-Decreasing Q - 2024

Question 3: 2024 - Set 2 - Q25 - 2 M -

INCREASING–DECREASING

Q : Show that $f(x) = e^x – e^{-x} + x – \tan^{-1}(x)$ is strictly increasing in its domain.

Question 4: 2024 - Set 3 - Q27(a) - 3 M -

INCREASING–DECREASING

Q : Find intervals where $f(x) = (\log x)/x$ is strictly increasing or strictly decreasing.

Question 5: 2024 - Set 4 - Q18 - 1 M -

INCREASING–DECREASING

Q : The function $f(x) = kx – \sin x$ is strictly increasing for:

A) $k > 1$ B) $k < 1$

C) $k > –1$ D) $k < –1$

Question 6: 2024 - Set 4 - Q23 - 2 M -

INCREASING–DECREASING

Q : Find the interval where $f(x) = x^4 – 4x^3 + 10$ is strictly decreasing.

Type (1) : Increasing-Decreasing Q - 2023

Type (1) : Increasing-Decreasing Q - 2023

Question 1: 2023 - Set 1 - Q16 - 1 M -

Increasing–Decreasing

Q : If f(x) = a(x − cos x) is strictly decreasing in ℝ, then ‘a’ belongs to

(a) [0] (b) (0, ∞) (c) (−∞, 0) (d) (−∞, ∞)

Question 2: 2023 - Set 1 - Q25 - 2 M -

Increasing–Decreasing

Q : Show that the function f(x) = 16 sin x / (4 + cos x) − x is strictly decreasing in (π/2, π).

Question 3: 2023 - Set 2 - Q37 - 4 M -

Increasing–Decreasing

Q : Case Study — 2

The use of electric vehicles will curb air pollution in the long run. The use of electric vehicles is increasing every year and the estimated EV count at time t is

$V(t) = (1/5)\,t^3 - (5/2)\,t^2 + 25\,t - 2$

where t = 1, 2, 3, ... correspond to years 2001, 2002, 2003, ...

(i) Can the above function estimate vehicle count for year 2000? Justify.

(ii) Prove that V(t) is an increasing function.

Type (1) : Increasing-Decreasing Q - 2023

Question 4: 2023 - Set 3 - Q23 - 2 M -

Increasing–Decreasing

Q : If $f(x) = a(\tan x - \cot x)$, where $a > 0$, determine whether $f(x)$ is increasing or decreasing in its domain.

Question 5: 2023 - Set 3 - R37 - 4 M -

Increasing–Decreasing

Q : Case Study – 2

A rainwater harvesting tank with square base and capacity 250 m^3 is to be built.

Land cost = ₹ 5000 per m^2

Digging cost = ₹ 40000 h^2, where h is depth (in m).

Let x = side of square base (in m).

(i) Find total cost C in terms of x.

(ii) Find dC/dx.

(iii) Check whether C(x) is increasing for $x > 0$.

Question 6: 2023 - Set 5 - Q9 - 1 M -

Increasing–Decreasing

Q : The interval in which the function

$f(x) = 2x^3 + 9x^2 + 12x - 1$ is decreasing is

(a) $(-1, \infty)$ (b) $(-2, -1)$ (c) $(-\infty, -2)$ (d) $[-1, 1]$