JEE Main Mathematics Sample Paper-2

Duration: 1 Hour **Maximum Marks: 100**

Instructions

- This paper contains TWO sections: **Section A** (MCQs) and **Section B** (Numerical).
- Section A contains 20 Multiple Choice Questions.
- Section B contains 5 Numerical Value Questions.
- Each correct answer carries **+4 marks**.
- Each incorrect answer carries **-1 mark**.
- No negative marking for unattempted questions.

Section A — Multiple Choice Questions

Q1. Let L_1 and L_2 be the lines $x + y = 11$ and $x + 2y = 16$. If a point $P(\frac{11}{2}, \alpha)$ lies on or inside the triangle formed by L_1, L_2 and $2x + 3y = 29$, then the product of the smallest and largest possible values of α is: [JEE Main 2023]

(A) 30

(B) 33

(C) 22

(D) 55

Q2. Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$. If $\hat{c}$ is a unit vector in the plane of $\vec{a}$ and $\vec{b}$ and is perpendicular to $\vec{a}$, then $\hat{c}$ is: [JEE Main 2021]

(A) $\frac{1}{\sqrt{2}}(\hat{i} - \hat{k})$

(B) $\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} + \hat{k})$

(C) $\frac{1}{\sqrt{5}}(\hat{j} - 2\hat{k})$

(D) $\frac{1}{\sqrt{2}}(\hat{j} - \hat{k})$

Q3. Three distinct numbers are selected randomly from the set $\{1, 2, \ldots, 40\}$. If the probability that the selected numbers are in an increasing Geometric Progression is m/n where $\gcd(m, n) = 1$, then $m + n$ is equal to: [JEE Main 2022]

(A) 2477

(B) 2481

(C) 2501

(D) 1240

Q4. If the shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x}{1} = \frac{y}{\alpha} = \frac{z-5}{1}$ is $\frac{5}{\sqrt{6}}$, then the sum of all possible values of α is: [JEE Main 2023]

(A) 3

(B) -3

(C) -6

(D) 0

Q5. Let $f(x) = \min\{[x], \{x\}\}$, where $[x]$ denotes the greatest integer function and $\{x\}$ denotes the fractional part. The number of points of discontinuity of $f(x)$ in the interval $[-2, 2]$ is: [JEE Main 2022]

(A) 2

(B) 3

(C) 4

(D) 1

Q6. If a circle C passes through the point $(1, 1)$ and intersects the circle $x^2 + y^2 + 2x - 4y + 1 = 0$ orthogonally, then the locus of its center (h, k) is: [JEE Main 2021]

(A) $4x - 2y + 1 = 0$

(B) $2x - 4y + 1 = 0$

(C) $3x + 2y - 1 = 0$

(D) $x + y - 2 = 0$

Q7. The coefficient of x^{10} in the expansion of $(1+x+x^2+x^3)^{11}$ is: [JEE Main 2023]

(A) 990

(B) 1001

(C) 1105

(D) 985

Q8. Let z be a complex number such that $|z-i| = |z+i| = |z-1|$. Then the area of the triangle formed by vertices z, iz, and $z+iz$ is: [JEE Main 2020]

(A) 1

(B) 1/2

(C) 2

(D) 0

Q9. The value of the definite integral $\int_0^{\pi/2} \frac{\cos^2 x}{\cos^2 x + 4\sin^2 x} dx$ is: [JEE Main 2022]

(A) $\pi/6$

(B) $\pi/12$

(C) $\pi/4$

(D) $\pi/3$

Q10. The eccentricity of an ellipse whose latus rectum is half of its minor axis is: [JEE Main 2023]

(A) $1/2$

(B) $\sqrt{3}/2$

(C) $1/\sqrt{2}$

(D) $\sqrt{3}/4$

Q11. The number of ways in which 5 boys and 3 girls can be seated in a row such that no two girls are together is: [JEE Main 2021]

(A) 14400

(B) 12000

(C) 7200

(D) 2400

Q12. If the system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ has infinite solutions, then $\lambda + \mu$ is: [JEE Main 2022]

(A) 13

(B) 10

(C) 7

(D) 15

Q13. The mean and variance of 7 observations are 8 and 16 respectively. If five of the observations are 2, 4, 10, 12, 14, then the product of the remaining two observations is: [JEE Main 2023]

(A) 48

(B) 40

(C) 44

(D) 36

Q14. If the function $f(x) = \frac{x}{x^2+1}$ is increasing in the interval (a, b), then the maximum value of $b - a$ is: [JEE Main 2021]

(A) 1

(B) 2

(C) 0.5

(D) ∞

Q15. The area bounded by the curves $y = \ln x, y = 0$ and $x = e$ is: [JEE Main 2022]

(A) 1

(B) e

(C) $e - 1$

(D) $1/e$

Q16. Let A be a 3×3 matrix such that $|A| = 2$. Then $|\text{adj}(2A)|$ is equal to: [JEE Main 2023]

(A) 2^8

(B) 2^4

(C) 2^6

(D) 2^2

Q17. The number of real solutions of the equation $e^{2x} - 3e^x + 2 = 0$ is: [JEE Main 2021]

(A) 2

(B) 1

(C) 0

(D) 4

Q18. The probability of getting a sum of 7 or 11 in a single throw of two dice is: [JEE Main 2020]

(A) $2/9$

(B) $1/6$

(C) $5/36$

(D) $1/9$

Q19. If $2x + 3y = 1$ is a tangent to the circle $x^2 + y^2 = r^2$, then $13r^2$ is: [JEE Main 2022]

(A) 1

(B) 13

(C) 0.5

(D) 2

Q20. The value of $\lim_{x\to 0} \frac{1-\cos 2x}{x^2}$ is: [JEE Main 2021]

(A) 2

(B) 1

(C) 4

(D) 0.5

Section B — Numerical Questions

Q21. If the sum of the squares of the roots of the quadratic equation $x^2 - (k-2)x - (k+1) = 0$ is minimum, then the value of k is: [JEE Main 2021]

Q22. The area (in sq. units) of the region bounded by the curve $y^2 = 2x$ and the line $x - y = 4$ is: [JEE Main 2023]

Q23. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then the value of $|\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}|$ is: [JEE Main 2022]

Q24. Let $y(x)$ be the solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = x^2$. If $y(1) = 1$, then the value of $4y(2)$ is: [JEE Main 2023]

Q25. If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then the sum of all elements of the matrix A^{10} is: [JEE Main 2021]

Detailed Solutions

Q1.

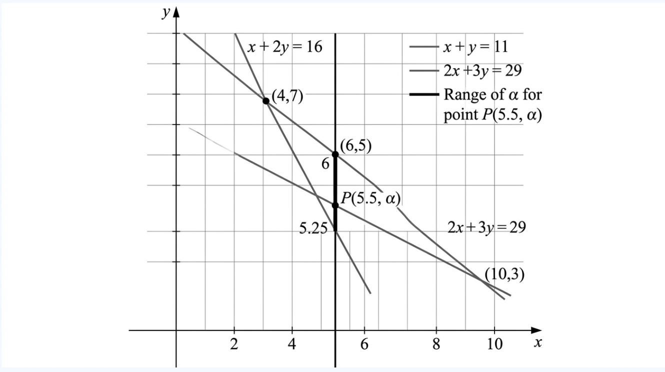
Solution

Detailed Analysis:

For $P(5.5, \alpha)$ to lie inside the triangle formed by

$$L_1 : x + y = 11, \quad L_2 : x + 2y = 16, \quad L_3 : 2x + 3y = 29,$$

the value of α must lie between the bounding y-values at $x = 5.5$.



Step 1: Substitute $x = 5.5$

$$\begin{aligned} L_1 :& \quad 5.5 + y = 11 \Rightarrow y_1 = 5.5 \\ L_2 :& \quad 5.5 + 2y = 16 \Rightarrow y_2 = 5.25 \\ L_3 :& \quad 11 + 3y = 29 \Rightarrow y_3 = 6 \end{aligned}$$

Step 2: Identify bounds

Triangle vertices:

$$(6, 5), \ (4, 7), \ (10, 3)$$

At $x = 5.5$, valid region gives:

$$5.5 \le \alpha \le 6$$

Final Answer:

$$\alpha_{\min} = 5.5, \quad \alpha_{\max} = 6, \quad \text{Product} = 33$$

Answer: (B)

Q2.

Solution

Detailed Analysis:

We need a unit vector $\hat{c}$ in the plane of $\vec{a}, \vec{b}$ such that $\vec{c} \cdot \vec{a} = 0$.

Step 1: Given vectors

$$\vec{a} = \hat{i} + 2\hat{j} + \hat{k}, \quad \vec{b} = 2\hat{i} + \hat{j} - \hat{k}$$

$$|\vec{a}|^2 = 1^2 + 2^2 + 1^2 = 6$$
$$\vec{a} \cdot \vec{b} = 2 + 2 - 1 = 3$$

Step 2: Use identity

$$\vec{a} \times (\vec{b} \times \vec{a}) = (\vec{a} \cdot \vec{a})\vec{b} - (\vec{a} \cdot \vec{b})\vec{a}$$

$$\begin{aligned} \vec{c} &= 6\vec{b} - 3\vec{a} \\ &= (12\hat{i} + 6\hat{j} - 6\hat{k}) - (3\hat{i} + 6\hat{j} + 3\hat{k}) \\ &= 9\hat{i} - 9\hat{k} \end{aligned}$$

$$|\vec{c}| = 9\sqrt{2}$$

Unit vector:

$$\hat{c} = \frac{1}{\sqrt{2}}(\hat{i} - \hat{k})$$

Answer: (A)

Q3.

Solution

Detailed Analysis:
We count 3-term increasing G.P.s in $\{1, 2, \ldots, 40\}$.
Total outcomes:

$$n(S) = \binom{40}{3} = 9880$$

Favourable cases:

- $p = 2$: $k \leq 10 \Rightarrow 10$
- $p = 3$: $q = 1, 2$, each gives $k \leq 4 \Rightarrow 8$
- $p = 4$: $q = 1, 3$, each gives $k \leq 2 \Rightarrow 4$
- $p = 5$: $q = 1, 2, 3, 4$, each gives $k = 1 \Rightarrow 4$
- $p = 6$: $q = 1, 5$, each gives $k = 1 \Rightarrow 2$

$$n(E) = 28, \quad P(E) = \frac{28}{9880} = \frac{7}{2470}$$

$$m + n = 2477$$

Answer: (A)

Q4.

Solution

Detailed Analysis:
Shortest distance:

$$d = \frac{|(\vec{a}_2 - \vec{a}_1) \cdot (\vec{b}_1 \times \vec{b}_2)|}{|\vec{b}_1 \times \vec{b}_2|}$$

Given:

$$A(1, 2, 3), \quad B(0, 0, 5)$$

$$\vec{b}_1 = (2, 3, 4), \quad \vec{b}_2 = (1, \alpha, 1)$$

$$\vec{AB} = (-1, -2, 2)$$

$$\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 4 \\ 1 & \alpha & 1 \end{vmatrix}$$
$$= (3 - 4\alpha)\hat{i} + 2\hat{j} + (2\alpha - 3)\hat{k}$$

$$D = 8\alpha - 13$$

$$|\vec{b}_1 \times \vec{b}_2|^2 = 20\alpha^2 - 36\alpha + 22$$

$$\frac{(8\alpha - 13)^2}{20\alpha^2 - 36\alpha + 22} = \frac{25}{6}$$

$$\alpha^2 + 3\alpha - 4 = 0 \Rightarrow \alpha = 1, -4$$

$$\text{Sum} = -3$$

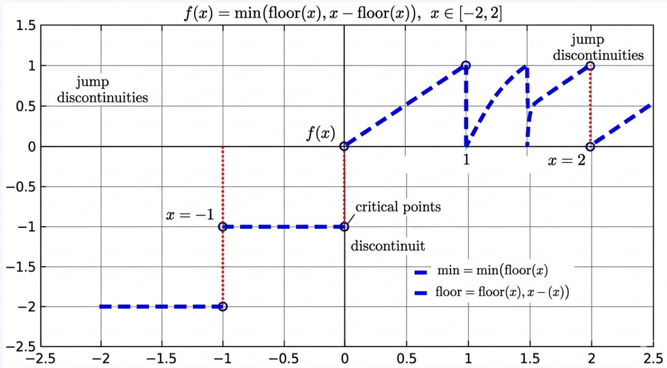
Answer: (B)

Q5.

Solution

Detailed Analysis:

$$f(x) = \min([x],\, x - [x]), \quad x \in [-2, 2]$$



Piecewise behaviour:

- $[-2, -1) : f(x) = -2$
- $[-1, 0) : f(x) = -1$
- $[0, 1) : f(x) = 0$
- $[1, 2) : f(x) = x + 1$
- $x = 2 : f(x) = 0$

Check discontinuities:

- $x = -1$: jump
- $x = 0$: jump
- $x = 1$: continuous
- $x = 2$: jump

$$\text{Total discontinuities} = 3$$

Answer: (B)

Q6.

Solution

Detailed Analysis:
For circles

$$x^2 + y^2 + 2gx + 2fy + c = 0, \quad x^2 + y^2 + 2g'x + 2f'y + c' = 0,$$

orthogonality condition:

$$2gg' + 2ff' = c + c'$$

Step 1: Passing through $(1, 1)$

$$1 + 1 + 2g + 2f + c = 0 \Rightarrow c = -2g - 2f - 2$$

Step 2: Orthogonality
Given circle: $g' = 1, \ f' = -2, \ c' = 1$

$$2g(1) + 2f(-2) = c + 1$$
$$2g - 4f = (-2g - 2f - 2) + 1$$
$$4g - 2f + 1 = 0$$

Step 3: Locus of center
Center $(h, k) = (-g, -f)$

$$g = -h, \quad f = -k$$

$$4(-h) - 2(-k) + 1 = 0 \Rightarrow 4h - 2k + 1 = 0$$

$$\boxed{4x - 2y + 1 = 0}$$

Answer: (A)

Q7.

Solution

Detailed Analysis:

$$(1+x+x^2+x^3)^{11} = (1+x)^{11}(1+x^2)^{11}$$

We need coefficient of x^{10}.

Step 1: General terms

$$\sum_{r=0}^{11}\binom{11}{r}x^r, \quad \sum_{k=0}^{11}\binom{11}{k}x^{2k}$$

Condition:

$$r + 2k = 10$$

Step 2: Valid pairs

$$(k, r) = (0, 10), (1, 8), (2, 6), (3, 4), (4, 2), (5, 0)$$

Step 3: Coefficient

$$C = \binom{11}{0}\binom{11}{10} + \binom{11}{1}\binom{11}{8} + \binom{11}{2}\binom{11}{6} + \binom{11}{3}\binom{11}{4} + \binom{11}{4}\binom{11}{2} + \binom{11}{5}\binom{11}{0}$$

$$\boxed{1001}$$

Answer: (B)

Q8.

Solution

Detailed Analysis:

$$|z - i| = |z + i| \Rightarrow \text{Real axis } (y = 0)$$

$$|z - i| = |z - 1| \Rightarrow \text{line } y = x$$

Intersection:

$$y = 0, \;\; y = x \Rightarrow (0, 0)$$

$$\boxed{0}$$

Answer: (D)

Q9.

Solution

Detailed Analysis:

$$I = \int_0^{\pi/2} \frac{\cos^2 x}{\cos^2 x + 4\sin^2 x}\, dx$$

Step 1: Simplify

$$I = \int_0^{\pi/2} \frac{1}{1 + 4\tan^2 x}\, dx$$

Step 2: Substitution

Let $\tan x = t \Rightarrow dx = \frac{dt}{1+t^2}$

$$I = \int_0^{\infty} \frac{1}{(1+4t^2)(1+t^2)}\, dt$$

Step 3: Partial fractions

$$= \frac{1}{3}\int_0^{\infty} \left(\frac{4}{1+4t^2} - \frac{1}{1+t^2}\right) dt$$

Step 4: Evaluate

$$I = \frac{1}{3}\left[2\tan^{-1}(2t) - \tan^{-1}(t)\right]_0^{\infty}$$

$$I = \frac{\pi}{6}$$

Answer: (A)

Q10.

Solution

Detailed Analysis:

Ellipse:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\text{Latus rectum } = \frac{2b^2}{a}, \quad \text{minor axis } = 2b$$

Step 1: Given relation

$$\frac{2b^2}{a} = b \Rightarrow 2b = a$$

$$\frac{b}{a} = \frac{1}{2}$$

Step 2: Eccentricity

$$e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

Answer: (B)

Q11.

Solution

Detailed Analysis:
Use the gap method to ensure no two girls are together.

Step 1: Arrange boys

$$5! = 120$$

Step 2: Place girls
Number of gaps:

$$\_B\_B\_B\_B\_B\_ \Rightarrow 6 \text{ gaps}$$

Select and arrange 3 girls:

$$^6P_3 = 6 \times 5 \times 4 = 120$$

Total ways:

$$120 \times 120 = 14400$$

Answer: (A)

Q12.

Solution

Detailed Analysis:
For infinite solutions, the system must reduce to a dependent equation.

Given:

$$x + y + z = 6$$
$$x + 2y + 3z = 10$$
$$x + 2y + \lambda z = \mu$$

Step: Subtract equations

$$(x + 2y + \lambda z) - (x + 2y + 3z) = \mu - 10$$
$$(\lambda - 3)z = \mu - 10$$

For infinite solutions:

$$\lambda - 3 = 0, \quad \mu - 10 = 0$$

$$\lambda = 3, \quad \mu = 10$$

$$\lambda + \mu = 13$$

Answer: (A)

Q13.

Solution

Detailed Analysis:

$$\bar{x} = \frac{\sum x_i}{n}, \quad \sigma^2 = \frac{\sum x_i^2}{n} - (\bar{x})^2$$

Given:

$$n = 7, \quad \bar{x} = 8, \quad \sigma^2 = 16$$

Step 1: Sum

$$\sum x_i = 56$$

$$2 + 4 + 10 + 12 + 14 + a + b = 56 \Rightarrow a + b = 14$$

Step 2: Sum of squares

$$\sum x_i^2 = 560$$

$$4 + 16 + 100 + 144 + 196 + a^2 + b^2 = 560$$
$$a^2 + b^2 = 100$$

Step 3: Use identity

$$(a + b)^2 = a^2 + b^2 + 2ab$$

$$196 = 100 + 2ab \Rightarrow ab = 48$$

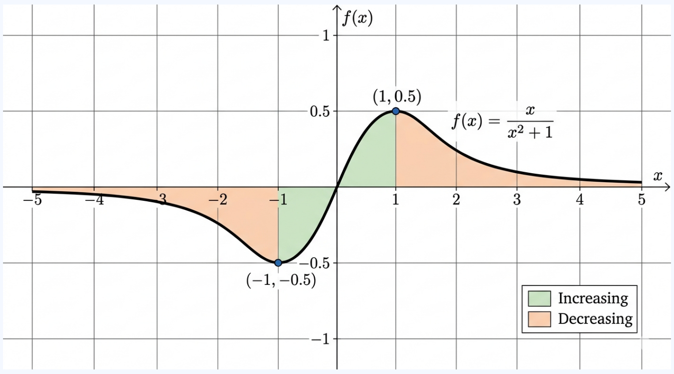
Answer: (A)

Q14.

Solution

Detailed Analysis:

Function is increasing where $f'(x) > 0$.



$$f(x) = \frac{x}{x^2 + 1}$$

$$f'(x) = \frac{(x^2 + 1) - 2x^2}{(x^2 + 1)^2}$$
$$= \frac{1 - x^2}{(x^2 + 1)^2}$$

$$1 - x^2 > 0 \Rightarrow x \in (-1, 1)$$

$$b - a = 2$$

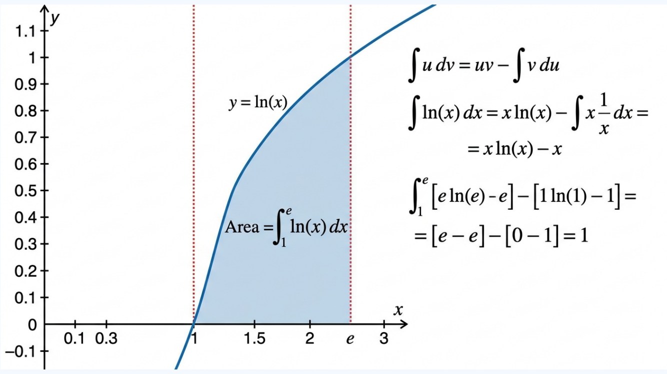
Answer: (B)

Q15.

Solution

Detailed Analysis:

$$\int_1^e \ln x \, dx$$



Using integration by parts:

$$u = \ln x, \quad dv = dx$$

$$du = \frac{1}{x}dx, \quad v = x$$

$$\int \ln x \, dx = x \ln x - x$$

$$\begin{aligned} \text{Area} &= [x \ln x - x]_1^e \\ &= (e - e) - (0 - 1) \\ &= 1 \end{aligned}$$

Answer: (A)

Q16.

Solution

Detailed Analysis:

$$|kA| = k^n|A|, \quad |\operatorname{adj}(A)| = |A|^{n-1}$$

Given:

$$n = 3, \quad |A| = 2$$

Let $B = 2A$.

$$|B| = 2^3 \cdot 2 = 16$$

$$|\operatorname{adj}(B)| = |B|^2 = 16^2 = 256 = 2^8$$

Answer: (A)

Q17.

Solution

Detailed Analysis:

$$e^{2x} - 3e^x + 2 = 0$$

Let $t = e^x$:

$$t^2 - 3t + 2 = 0$$

$$(t-1)(t-2) = 0 \Rightarrow t = 1, 2$$

$$x = 0, \quad x = \ln 2$$

$$\text{Total solutions} = 2$$

Answer: (A)

Q18.

Solution

Detailed Analysis:

Two dice outcomes:

$$n(S) = 36$$

Favourable cases:

Sum 7: 6 cases Sum 11: 2 cases

$$n(E) = 8$$

$$P(E) = \frac{8}{36} = \frac{2}{9}$$

Answer: (A)

Q19.

Solution

Detailed Analysis:

Distance from origin to line:

$$r = \frac{|ax + by + c|}{\sqrt{a^2 + b^2}}$$

Given line:

$$2x + 3y - 1 = 0$$

$$r = \frac{1}{\sqrt{13}}$$

$$\text{Circle: } x^2 + y^2 = r^2 = \frac{1}{13}$$

$$13r^2 = 1$$

Answer: (A)

Q20.

Solution

Detailed Analysis:

$$\lim_{x\to 0} \frac{1-\cos 2x}{x^2}$$

Use identity:

$$1-\cos 2x = 2\sin^2 x$$

$$= 2\left(\frac{\sin x}{x}\right)^2$$

$$= 2$$

Answer: (A)

Q21.

Solution

Detailed Analysis:
Given quadratic:

$$x^2 - (k-2)x - (k+1) = 0$$

Let roots be α, β.

$$\alpha + \beta = k-2, \quad \alpha\beta = -(k+1)$$

Step: Expression

$$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$$

$$\begin{aligned} f(k) &= (k-2)^2 + 2(k+1) \\ &= k^2 - 4k + 4 + 2k + 2 \\ &= k^2 - 2k + 6 \end{aligned}$$

Minimum value:
Parabola opens upward, so minimum at vertex:

$$k = \frac{2}{2} = 1$$

Answer: (1)

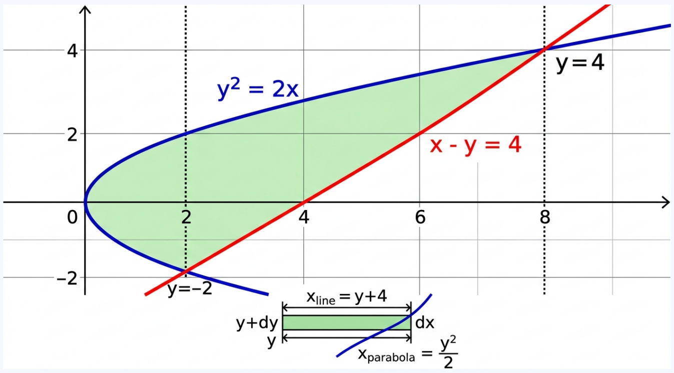
Q22.

Solution

Detailed Analysis:

Area between:

$$y^2 = 2x, \quad x - y = 4$$



Step 1: Intersection

$$x = \frac{y^2}{2}$$

$$\frac{y^2}{2} - y - 4 = 0 \Rightarrow y^2 - 2y - 8 = 0 \Rightarrow (y-4)(y+2) = 0$$

$$y = 4, \ -2$$

Step 2: Area

$$A = \int_{-2}^{4} \left[(y+4) - \frac{y^2}{2} \right] dy$$
$$= \left[\frac{y^2}{2} + 4y - \frac{y^3}{6} \right]_{-2}^{4}$$

$$A = \left(8 + 16 - \frac{64}{6}\right) - \left(2 - 8 + \frac{8}{6}\right)$$
$$= \frac{40}{3} + \frac{14}{3} = 18$$

Answer: (18)

Q23.

Solution

Detailed Analysis:

$$|\vec{a}| = |\vec{b}| = |\vec{c}| = 1, \quad \vec{a} + \vec{b} + \vec{c} = 0$$

Step: Square both sides

$$|\vec{a}|^2 + |\vec{b}|^2 + |\vec{c}|^2 + 2(\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}) = 0$$

$$3 + 2\Sigma(\vec{a} \cdot \vec{b}) = 0 \Rightarrow \Sigma(\vec{a} \cdot \vec{b}) = -\frac{3}{2}$$

$$\left|\Sigma(\vec{a} \cdot \vec{b})\right| = \frac{3}{2}$$

Answer: (1.5)

Q24.

Solution

Detailed Analysis:

$$x\frac{dy}{dx} + y = x^3$$

Step 1: Standard form

$$\frac{dy}{dx} + \frac{1}{x}y = x^2$$

Step 2: Integrating factor

$$IF = e^{\int \frac{1}{x}dx} = x$$

Step 3: Solution

$$xy = \int x^3 dx = \frac{x^4}{4} + C$$
$$y = \frac{x^3}{4} + \frac{C}{x}$$

Step 4: Use condition

$$y(1) = 1 \Rightarrow 1 = \frac{1}{4} + C \Rightarrow C = \frac{3}{4}$$

$$y = \frac{x^3}{4} + \frac{3}{4x}$$

Step 5: Evaluate

$$y(2) = 2 + \frac{3}{8} = \frac{19}{8}$$
$$4y(2) = \frac{19}{2} = 9.5$$

Answer: (9.5)

Q25.

Solution

Detailed Analysis:

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$$

Step: Pattern

$$A^n = \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$$

$$A^{10} = \begin{bmatrix} 1 & 10 \\ 0 & 1 \end{bmatrix}$$

Sum of elements:

$$1 + 10 + 0 + 1 = 12$$

Answer: (12)

Answer Key — Section A

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	A	4	B	5	B
6	A	8	D	9	A	10	B	11	A
12	A	13	A	14	B	15	A	16	A
17	A	18	A	19	A	20	A		

Answer Key — Section B

Q	Ans	Q	Ans
7	B	21	1
22	18	23	1.5
24	9.5	25	12