Mathematics Section A

Section Id :	67603377
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	67603377
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 6760331141 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If $S_1 = \{x \in \mathbb{R} : x^2 + |x| - 2 = 0\}$ and $S_2 = \{x \in \mathbb{R} : x^2 + x - 2 = 0\}$, then

Options :

6760333421. $S_1 \cup S_2$ has 4 elements.

6760333422. $S_1 \cup S_2$ has 2 elements.

6760333423. $S_1 \cap S_2$ has 2 elements.

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6760333424. $S_1 \cap S_2$ has 1 element.

Question Number : 62 Question Id : 6760331142 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$.

Then the set $\{n \in \mathbb{N} \mid A^n + A^{n+1} + A^{n+2} = B\}$ is

Options :

6760333425. an empty set

6760333426. a finite set

6760333427. a proper infinite subset of $\mathbb{N}$

6760333428. equal to $\mathbb{N}$

Question Number : 63 Question Id : 6760331143 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let A be a square matrix of order 3 and $|A| = 3$.

If $|\text{Adj}(3\ \text{Adj}(4A))| = 2^m \cdot 3^n$, then the ordered pair (m, n) is equal to

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Options :

6760333429. $(20, 8)$

6760333430. $(20, 10)$

6760333431. $(24, 9)$

6760333432. $(24, 10)$

Question Number : 64 Question Id : 6760331144 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

For the system of linear equations

$$x + 3y + 2z = 7$$

$$x + \lambda y + 3z = 8$$

$$x - 2y + 7z = \mu,$$

which of the following statements is **NOT** true?

Options :

6760333433. The system has infinitely many solutions if $\lambda = 2$ and $\mu = 12$.

6760333434. The system has no solution if $\lambda = 2$ and $\mu \neq 12$.

6760333435. The system has a unique solution if $\lambda \neq 2$ and $\mu = 12$.

6760333436. The system has no solution if $\lambda \neq 2$ and $\mu \neq 12$.

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Question Number : 65 Question Id : 6760331145 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The value of the limit : $\lim\limits_{x\to 4}\ 2^{x}+2^{5-x}-17^{\frac{1}{8-2^{3x/4}}}$ is equal to

Options :

6760333437. $e^{7/3}$

6760333438. $e^{-7/3}$

6760333439. $e^{3/7}$

6760333440. $3e^{7}$

Question Number : 66 Question Id : 6760331146 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Suppose that the function

$$f(x)=\begin{cases}x^2-[x]+2a; & x<-1\\ 4x+5-b; & -1\le x<2\\ 3x^2+6[x]-2a; & x\ge 2\end{cases}$$

is continuous on $(-2, 3)$ for some values of a and b where $[x]$ denotes the greatest integer function. Then the value of $8ab$ is

Options :

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6760333441. 135

6760333442. -117

6760333443. -104

6760333444. 99

Question Number : 67 Question Id : 6760331147 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The sum of the intercepts on the coordinate axes made by the tangent at any point on the curve, $\sqrt{x}+\sqrt{y}=3$ is

Options :

6760333445. 3

6760333446. 6

6760333447. 9

6760333448. 12

Question Number : 68 Question Id : 6760331148 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

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A plane passes through the points A(1, 2, 3), B(3, 5, 2) and C(2, 1, 5). If P(a, b, c) be a point such that $a(b + c) = bc$, then the acute angle which the line OP (O is the origin and P≠O) makes with the plane is

Options :

6760333449. $\frac{\pi}{4}$

6760333450. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

6760333451. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

6760333452. $\frac{\pi}{6}$

Question Number : 69 Question Id : 6760331149 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\int \frac{4x+13}{\sqrt{x^2+5x+6}}dx = A\sqrt{x^2+5x+6} + B\log_e\left|\left(x+\frac{5}{2}\right)+\sqrt{x^2+5x+6}\right| + C$

(C is a constant of integration), then the ordered pair (A, B) is equal to

Options :

6760333453. $(3, 4)$

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6760333454. $\left(4, \frac{3}{2}\right)$

6760333455. $(2, 3)$

6760333456. $(4, 3)$

Question Number : 70 Question Id : 6760331150 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

$\int_1^2 \left[x^2 - 1\right] + \left[x^2 + 1\right] \, dx$ is equal to ([t] denotes the greatest integer $\leq t$)

Options :

6760333457. $\frac{14}{3}$

6760333458. $5 - \sqrt{2} - \sqrt{3}$

6760333459. 1

6760333460. $10 - 2\sqrt{2} - 2\sqrt{3}$

Question Number : 71 Question Id : 6760331151 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

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If $x = x(y)$ is the solution of the differential equation,

$$2 \cdot \sqrt{\sin x + \tan^{-1} y} \cdot \frac{dy}{dx} = \left(\cos x + \frac{1}{1+y^2} \frac{dy}{dx} \right)$$ satisfying $x(0) = 0$ and $x(1) = b$, then

Options :

6760333461. $4 \sin b + \pi = 4$

6760333462. $4 \cos b + \pi = 4$

6760333463. $2 \sin b + \pi = 2$

6760333464. $2 \cos b + \pi = 2$

Question Number : 72 Question Id : 6760331152 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The sum of the values of 'a' for which circles of radius $\frac{\sqrt{5}}{3}$, touch the straight lines, $x - 2y - a = 0$ and $3x - 6y + 7 = 0$, is

Options :

6760333465. $\frac{14}{3}$

6760333466. $-\frac{20}{3}$

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6760333467. $\frac{10}{3}$

6760333468. $-\frac{14}{3}$

Question Number : 73 Question Id : 6760331153 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the line $\alpha x + \beta y = 1$ touches the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then the locus of the point (α, β) is

Options :

6760333469. $a^2x^2 - b^2y^2 = 1$

6760333470. $b^2x^2 - a^2y^2 = 1$

6760333471. $a^2x^2 + b^2y^2 = 1$

6760333472. $b^2x^2 + a^2y^2 = 1$

Question Number : 74 Question Id : 6760331154 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

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If the tangents at the points $(2, y)$ on the ellipse, $\frac{x^2}{16}+\frac{y^2}{4}=1$ meet the tangent at $(4, y_1)$ on it at the points A and B, then the length of the line segment AB is

Options :

6760333473. $2\sqrt{3}$

6760333474. $\frac{2\sqrt{3}}{3}$

6760333475. $\frac{4\sqrt{3}}{3}$

6760333476. $4\sqrt{3}$

Question Number : 75 Question Id : 6760331155 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The distance of the origin from the point of intersection of the line, $\frac{x}{2}=\frac{y+1}{3}=\frac{z-1}{-1}$ and the plane, $2x + y + 6z + 1 = 0$ is

Options :

6760333477. $4\sqrt{6}$

6760333478. $2\sqrt{3}$

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6760333479. $\sqrt{544}$

6760333480. $\sqrt{554}$

Question Number : 76 Question Id : 6760331156 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The plane which is parallel to $\vec{r}\cdot\left(\hat{i}+2\hat{j}+3\hat{k}\right)=6$ and passes through (1, 2, 3), also passes through the point

Options :

6760333481. $(2, 6, 1)$

6760333482. $(2, 6, 0)$

6760333483. $(3, 6, -1)$

6760333484. $(3, 5, 1)$

Question Number : 77 Question Id : 6760331157 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\sum_{i=1}^{16} a_i - 6 = 8$ and $\sum_{i=1}^{16} a_i - 6^2 = 40$, then the standard deviation of $a_1, a_2, \ldots, a_{16}$ is

Options :

6760333485. $\frac{2}{3}$

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6760333486. $\frac{3}{2}$

6760333487. $\frac{5}{2}$

6760333488. $\frac{2}{5}$

Question Number : 78 Question Id : 6760331158 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Let A = {0, 1, 2, 3, 4, 5}. Then the probability that a randomly selected onto function f from A to A satisfies $f(1) + f(2) = f(3)$ is

Options :

6760333489. $\frac{1}{10}$

6760333490. $\frac{3}{20}$

6760333491. $\frac{1}{20}$

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6760333492. $\frac{1}{15}$

Question Number : 79 Question Id : 6760331159 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A vertical pole consists of two portions, the lower being $\frac{1}{3}$ rd of the whole. If the upper portion subtends an angle $\tan^{-1}\left(\frac{1}{2}\right)$ at a point on a horizontal plane drawn through the foot of the pole and at a distance 40 m from it, then the height (in m) of the pole can be

Options :

6760333493. 36

6760333494. 35

6760333495. 40

6760333496. 60

Question Number : 80 Question Id : 6760331160 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If $\square, \Diamond \in \{\wedge, \vee\}$ such that $(\sim q \wedge p) \square (q \Diamond \sim p)$ is a tautology, then

Options :

6760333497. $\square = \wedge$ and $\Diamond = \wedge$

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6760333498. $\square = \wedge$ and $\Diamond = \vee$

6760333499. $\square = \vee$ and $\Diamond = \wedge$

6760333500. $\square = \vee$ and $\Diamond = \vee$

Mathematics Section B

Section Id :	67603378
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	67603378
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 6760331161 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $x^2 - x + 1 = 0$, then the value of $\sum_{n=1}^{5}\left(x^n + \frac{1}{x^n}\right)^2$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal

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Text Areas : PlainText
Possible Answers :
100

Question Number : 82 Question Id : 6760331162 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The sum of modulus of all non-real roots of the equation,
$(x^2 + 4x + 6)(2x^2 + 8x + 14) = 12$ is equal to _____ .
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 83 Question Id : 6760331163 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
If the number of permutations of the word "STATISTICS" in which all 'S' do not come together, is $(56)^2k$, then 'k' is equal to _____.
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 84 Question Id : 6760331164 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

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The remainder when $(2020)^{2022}$ is divided by 337 is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 85 Question Id : 6760331165 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $n \geq 1$ be an odd integer and $S_n = n^3 - (n-1)^3 + (n-2)^3 - \ldots + (-1)^{n-1}\, 1^3$.

If $S_{199} - 4\, S_{99} = 10^6\, \lambda$, then the value of λ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 86 Question Id : 6760331166 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $f(x) = x + 1$ and g be maps on $\mathbb{R}$ and $h(n) = (g \circ f)(n+1) - (g \circ f)(n)$, $n \in \mathbb{N}$.

Further, $h(1)$, $h(2)$, $h(3)$, $h(4)$, ……., is an A.P. and $h(25) = 53$, $h(101) = 205$.
If $g(48) - g(2) = 100k$, then 'k' is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal

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Text Areas : PlainText
Possible Answers :
100

Question Number : 87 Question Id : 6760331167 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the area of the region enclosed by the curve $y = x^2$ and the line $y = ax$ is 36 sq. units, then $|a|$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 88 Question Id : 6760331168 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the area of ΔABC with vertices A(0, 1), B(2, 3) and C(4, b) is 6 sq. units, then the positive value of 'b' is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 89 Question Id : 6760331169 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

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If $f(x)$ be a differentiable function such that $f(9) = 9$ and $f'(9) = 4$, then $\lim\limits_{x \to 9} \dfrac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 90 Question Id : 6760331170 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The number of solutions of the equation $x^2 = \cot x$ in $[0, 2\pi]$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

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