MATHS

BOOKS - TS EAMCET PREVIOUS YEAR PAPERS

ONLINE QUESTION PAPER 2018

MATHEMATICS

1. The set of all values of x and the set of all values of a for which the real valued funtion

$f(x) = \sqrt{\log_a(x - [x])}$ is defined are respectively

A. $R - Z \text{ and } (0, 1)$

B. Z and $R - \{0, 1\}$

C. $Z^{-} \text{ and } (1, \infty)$

D. R and R

Answer: A

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2. A funtion f , $R - \{0\} \rightarrow$ R is defined as

$$f(x) = \begin{cases} x^2 + 3x - 7, & x > 0 \\ h(x), & x < 0 \end{cases}$$

If f (x) is an odd funtion, then $h(x) =$

A. $x^2 + 3x + 7$

B. $x^2 + 3x - 7$

C. $Z^- \text{ and } (1, \infty)$

D. $-x^2 - 3x + 7$

Answer: C

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3. $x^n + y^n$ is divisible by

A. $x -$ y for all $n \in N$

B. $x +$ y for all $n \in N$

C. $x +$ y for all $n = 2m - 1, m \in N$

D. $x +$ y for all $n = 2m, m \in N$

Answer: C

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4. Consider the set A of all determinants of order 3 with entries 0 or 1 only . Let B be the subset of A containing of all determinants with value 1. Let C be the subset of the set of all determinants with value - 1. Then

A. $n(C) = 0$

B. $n(B) = n(C)$

C. $A = B \cup C$

D. $n(B) = 2n(A)$

Answer: B

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5. $\begin{vmatrix} 1 & bc+ad & b^2c^2+a^2d^2 \\ 1 & ca+bd & c^2a^2+b^2d^2 \\ 1 & ab+cd & a^2b^2+c^2d^2 \end{vmatrix}$ =

A. (a - b)(b - c) (c - d) (a - d) (a - c) (d - b)

B. (a - b) (a - c) (b - c) (b - d) (a - d) (c - d)

C. (a -b) (a -c) (a - d) (b - c) (b - d) (d - c)

D. (a - b)(b - c) (c - d)(b - d)

Answer: B

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6. Let λ and α be real. The set of all values of λ for which the system of linear equations

$\lambda x + (\sin \alpha)y + (\cos \alpha)z = 0$

$x + (\cos \alpha)y + (\sin \alpha)z = 0$

$-x + (\sin \alpha)y - (\cos \alpha)z = 0$ has a non trivial solution is

A. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{4} + \frac{\pi}{8}$ (n is an integer)

B. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{8}$ (n is an integer)

C. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{8} - \frac{\pi}{8}$ (nis an integer)

D. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{4} - \frac{\pi}{8}$ (n is an integer)

Answer: C

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7. If $\frac{1 - 10i \cos \theta}{1 - 10\sqrt{3}i \sin \theta}$ is purely real, then one of the valus of θ is

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

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

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: A

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8. If z and w are complex numbers such that

$\bar{z} - \overline{iw} = 0 \text{ and } Arg(zw) = \frac{3\pi}{4}$, then Arg $z =$

A. A $\frac{\pi}{16}$

B. B $\frac{\pi}{8}$

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

D. D $\frac{3\pi}{4}$

Answer: B

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9. Find all the roots of the equation

$x^{11} - x^7 + x^4 - 1 = 0$

A. 2

B. 3

C. 7

D. 9

Answer: A

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10. If α is a root of $z^2 - z + 1 = 0$, then

$$\left(\alpha^{2014} + \frac{1}{\alpha^{2014}}\right) + \left(\alpha^{2015 + \frac{1}{\alpha^{2015}}}\right)^2 + \left(\alpha^{2016} + \frac{1}{\alpha^{2016}}\right)^3 + \left(\alpha^{2017} + \frac{1}{\alpha^{2017}}\right)^4 + \left(\alpha^{2018} + \frac{1}{\alpha^{2018}}\right)^5 =$$

A. 8

B. 5

C. 3

D. -5

Answer: A

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11. Let $E_1 \equiv ax^2 + bx + c$, $E_2 \equiv bx^2 + cx + a$, $E_3 \equiv cx^2 + bx + a$ and $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = 3$. If these quadratic expressions have a common zero, then the quadratic expression having zeros that are common to E_3 and different from the zeros of E_1 is

A. $x^2 - \frac{a(b+c)}{bc}x + bc$

B. $ax^2 + bx + c$

C. $x^2 - b(c+a)x + ac$

D. $x^2 - \frac{a(b+c)}{bc} + \frac{a^2}{bc}$

Answer: D

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12. If for any real x, $\frac{11x^2+12x+6}{x^2+4x+2}=$ y is such that $y<a$ or $y\geq$ b, then a, b are

A. 3,5

B. $-5, 3$

C. $-4, 5$

D. $-6, 4$

Answer: B

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13. Given that the roots of $x^3+3px^2+3qx+r=0$ are in harmonic progression Then,

A. $2q^3 = r(3pq - r)$

B. $q^3 = r(3pq - r)$

C. $q^3 = -r(3pq - r)$

D. $q^3 = r(r + 3pq)$

Answer: A

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14. If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0,$ then $\alpha^3 + \beta^3 + \gamma^3 =$

A. $p^3 - 3pq + r$

B. $p^2 - 2pq + r$

C. $3pq - 3r - p^3$

D. $3pq + 3r + p^3$

Answer: C

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15. The number of proper divisors of the number obtained by dividing 13! With 100 is

A. 216

B. 430

C. 214

D. 790

Answer: B

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16. In an admission test,there are 15 multiple choice questions. Each question is followed by 4 alternatives to choose. Out of these there may be one or more than one correct answers. If a student attempts all the 15 question and marks the answers randomly the question paper is

A. ${}^{4 \times 15}C_4$

B. 15^{15}

C. 4^{15}

D. 4!. 15!

Answer: B

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17. The absolute value of the numerically greatest term in the expansion of $(2x - 3y)^{12}$ when $x = 3, y = 2$ is

A. ${}^{12}C_5 6^{12}$

B. ${}^{12}C_6 6^{12}$

C. ${}^{12}C_4 6^{12}$

D. ${}^{12}C_9 6^{12}$

Answer: B

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18. The sum to infinite terms of the series

$$\frac{3}{10}+\frac{3.7}{10.15}+\frac{3.7.9}{10.15.20}+\ldots \text{ to } \infty \text{ is}$$

A. $\sqrt[4]{125}-1$

B. $\frac{5\sqrt{5}}{3\sqrt{3}}-\frac{8}{5}$

C. $\sqrt[3]{4}-\frac{4}{3}$

D. $\sqrt{\frac{5}{3}}-\frac{6}{5}$

Answer: B

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19.

$$\text{if } \frac{3x+2}{(x+1)(2x^2+3)}=\frac{A}{x+1}+\frac{Bx+C}{2x^2+3}, \text{ then } A-B+C=$$

A. 1

B. 2

C. 3

D. 5

Answer: B

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20.

$\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = m$ and $\tan 20^\circ \tan 40^\circ \tan 60^\circ \tan 80^\circ = n$

then $\frac{n}{m} =$

A. $\frac{3\sqrt{3}}{16}$

B. $16\sqrt{3}$

C. $\frac{16}{\sqrt{3}}$

D. $8\sqrt{3}$

Answer: B

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21. Assertion (A) If $\alpha = 12^\circ, \beta = 15^\circ, \gamma = 18^\circ$, then $\tan 2\alpha \tan 2\beta + \tan 2\beta \tan 2\gamma + \tan 2\gamma \tan 2\alpha = 1$ Reason (R) In ΔABC, $\tan \frac{A}{2} \tan \frac{B}{2} + \tan \frac{B}{2} \tan \frac{C}{2} + \tan \frac{C}{2} \tan \frac{A}{2} =$

Which of the following is true?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true, but (R) is not the correct explanation of (A)

C. (A) is true, but (R) is false

D. (A) is false, but (R) is true

Answer: A

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22. $\cot \theta - \tan \theta - 2 \tan 2\theta - 4 \tan 4\theta =$

A. $4 \cot 8\theta - \tan 6\theta$

B. $\cot 8\theta + \tan 3\theta$

C. $\cot 8\theta + \cot 6\theta$

D. $8 \cot 8\theta$

Answer: D

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23. If the general solution of

$\sin x + 3 \sin 3x + \sin 5x = 0$ is $x = y$ then the set of all values of cos y is

A. $\left\{-1, -\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{2}, 1\right\}$

B. $\left\{-1, \frac{1}{2}, 1\right\}$

C. $\left\{-\frac{\sqrt{3}}{2}, 0, 1, \frac{\sqrt{3}}{2}\right\}$

D. $\left\{-1, -\frac{1}{2}, \frac{1}{2}, 1\right\}$

Answer: D

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24. If $\cos^{-1} 2x + \cos^{-1} 3x = \frac{\pi}{3}, \quad \text{then} \quad x =$

A. $\frac{\sqrt{3}}{2\sqrt{7}}$

B. $\frac{\sqrt{3}}{\sqrt{7}}$

C. $\frac{\sqrt{2}}{\sqrt{5}}$

D. $\frac{\sqrt{3}}{2\sqrt{5}}$

Answer: A

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25. If $\cosh\beta = \sec\alpha\cos\theta, \sin h\beta = \quad \text{cosec} \quad \alpha\sin\theta, \quad \text{then} \quad \sinh^2\beta =$

A. $\sin\alpha\cos\alpha$

B. $\cos^2\alpha$

C. $\cos^2\alpha$

D. $\sin\alpha+\cos\alpha$

Answer: C

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26. If sin A , sin B are roots of $c^2x^2-c(a+b)x+ab=0,$ then the Δ le is

A. the triangle is acute angled

B. the triangle is obluse angled

C. $\sin C=\dfrac{\sqrt{3}}{2}$

D. $\sin A+\cos A=\dfrac{a+b}{c}$

Answer: D

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27. Let ABC be an isosceles triangle with BC as its base. Then, $rr_1 =$

A. a^2

B. $\frac{a^2}{2}$

C. $R^2 \sin^2 A$

D. $R^2 \sin^2 2B$

Answer: C

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28. In a $\Delta ABC, a^4 + b^4 + c^4 = 2b^2c^2 + 2a^2b^2, \quad \text{then B} =$

A. $\frac{\pi}{4}$ or $\frac{3\pi}{4}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$ or $\frac{2\pi}{3}$

D. $\frac{\pi}{6}$ or $\frac{5\pi}{6}$

Answer: A

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29. If $a = 2\hat{i} + 3\hat{j} + \hat{k}$, $b = \hat{i} - 3\hat{j} - 5\hat{k}$ and $c = 3\hat{i} - 4\hat{k}$, then match the items of List - I with those of List - II.

	List-I		List-II
A	Unit vector in the direction opposite to that **a** − **b** is	(i)	$5\hat{i} + 3\hat{j} - 3\hat{k}$
B	If **AB** = **a**, **BC** = **b**, then **CA** =	(ii)	$2\hat{i} - \frac{8}{3}\hat{k}$
C	If **a**, **b**, **c** are the position vectors of the vertices a triangle then, its centroid is	(iii)	$-3\hat{i} + 4\hat{k}$
D	In D part it is **b** + **d** instead of **b** − **d** If **d** is a vector of magnitude $2\sqrt{14}$ and parallel to the vector **a**, then **b** + **d** =	(iv)	$-\frac{\hat{i}}{\sqrt{73}} - \frac{6\hat{j}}{\sqrt{73}} - \frac{6\hat{k}}{\sqrt{73}}$
		(v)	$\frac{3}{\sqrt{43}}\hat{i} + \frac{5}{\sqrt{43}}\hat{j} - \frac{3}{\sqrt{43}}\hat{k}$

A. $\begin{matrix} A & B & C & D \\ iv & iii & ii & i \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ iv & iii & ii & v \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ iv & iii & i & ii \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ i & ii & iii & v \end{matrix}$

Answer: A

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30. If $2\hat{i} - \hat{j} + 3\hat{k}, \; - 12\hat{i} - \hat{j} - 3\hat{k}, \; - \hat{i} + 2\hat{j} - 4\hat{k}$ and $\lambda\hat{i} + 2\hat{j} - \hat{k}$ are the position vectors of four coplanar points,then $\lambda =$

A. -2

B. 6

C. 3

D. -6

Answer: B

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31. A point lying on the plane that passes through the point $\hat{i}-\hat{j}+\hat{k}, \hat{i}-2\hat{j}+3\hat{k}$ and $\hat{i}+2\hat{j}-3\hat{k}$ is

A. $-\hat{i}+2\hat{j}-3\hat{k}$

B. $-\hat{i}+\hat{j}-\hat{k}$

C. $\hat{i}+\hat{j}-\hat{k}$

D. $4\hat{i}+2\hat{j}+3\hat{k}$

Answer: C

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32. A non-zero vector a is parallel to the line of intersection of the plane determined by the vectors $\hat{i}, \hat{i}+\hat{j}$ and the plane determined by vectors $\hat{i}-\hat{j}, \hat{j}+\hat{k}$. The angle between a and $\left(\hat{i}-2\hat{j}+2\hat{k}\right)$ is

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

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

C. C $\frac{\pi}{3}$

D. D $\frac{2\pi}{5}$

Answer: D

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33. The equation of the plane passing through the point with position vectors $A\left(2\hat{i}+6\hat{j}-6\hat{k}\right)$,
$B\left(-3\hat{i}+10\hat{j}-9\hat{k}\right)$ and $C\left(-5\hat{i}-6\hat{k}\right)$ is

A. $r.\left(2\hat{i}-\hat{j}-2\hat{k}\right)=2$

B. $r.\left(\hat{i}-2\hat{j}-\hat{k}\right)=1$

C. $r.\left(2\hat{i}+\hat{j}-2\hat{k}\right)=3$

D. $r.\left(\hat{i}+2\hat{j}-2\hat{k}\right)=3$

Answer: A

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34. If a, b and c are three vectors qith magnitudes 1, 1 and 2 respectively and $a \times (a \times c) + b = 0$, then the angle between a and c is

A. $\frac{2\pi}{5}$

B. $\frac{\pi}{3}$

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

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

Answer: D

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35. The coefficient of variation of the first n natural numbers is

A. $\frac{100}{\sqrt{3}}(n-1)$

B. $\frac{100}{\sqrt{3}}\sqrt{\frac{n+1}{n-1}}$

C. $\frac{\sqrt{3}}{100}\sqrt{\frac{n+1}{n-1}}$

D. $\frac{100}{\sqrt{3}}\sqrt{\frac{n-1}{n-1}}$

Answer: D

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36. Two distributions A and B have the same mean. If their coefficients of variation are 6 and 2 respectively and σ_A, σ_B are their standard deviations,then

A. $\sigma_A = 3\sigma_B$

B. $3\sigma_A = \sigma_B$

C. $\sigma_A = 2\sigma_B$

D. $2\sigma_A = \sigma_B$

Answer: A

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37. From a certain population, the probability of chosing a colour blind man is $\frac{1}{20}$ and that of a colour blind woman is $\frac{1}{10}$. If a randomly chosen person is found to be colour blind, then the probability that the person is a man is

A. $\frac{2}{9}$

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

C. $\frac{1}{3}$

D. $\frac{1}{9}$

Answer: C

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38. From a lot containing n good and m bad articles, if 2 articles are picked are picked at random in succession without replacment,then the probability that the second article picked is bad is

A. $\frac{m}{m+n}$

B. $\frac{m-1}{m+n}$

C. $\frac{(n-1)(m-1)}{(m+n)^2}$

D. $\frac{mn}{(m+n)^2}$

Answer: A

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39. In a classroom 5% of the boys and 2% of the girls taller than 1.6 m. The class consists of 60% girl student. The probability that a randomly selected student is taken than 1.6 m is

A. $\frac{121}{125}$

B. $\frac{5}{8}$

C. $\frac{3}{8}$

D. $\frac{4}{125}$

Answer: D

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40. The distribution of a random variable X is given below

$X = x$	1	2	3	4
$P(X = x)$	$2c$	$4c$	$6c$	$8c$

Then, the standard deviation of X is

A. 4

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

C. 2

D. 1

Answer: D

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41. The probability of securing a succes in an trial is three times that of a failure. The probability of getting atleast 4 successes in 5 trial is

A. $\frac{649}{1024}$

B. $\frac{81}{128}$

C. $\frac{27}{64}$

D. $\frac{243}{1024}$

Answer: B

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42. If the line jjoining the point $A(b\cos\alpha, b\sin\alpha)$ and $B(a\cos\beta, a\sin\beta)$ is extended to the point $N(x, y)$ such that AN : NB $= b : a$, then

A. Option1 $x\cos\frac{\alpha-\beta}{2} + y\sin\frac{\alpha+\beta}{2} = 0$

B. Option2 $x\cos\frac{\alpha-\beta}{2} + y\sin\frac{\alpha-\beta}{2} = 0$

C. Option3 $x\cos\frac{\alpha-\beta}{2} + y\sin\frac{\alpha+\beta}{2} = 0$

D. Option4 $x\cos\frac{\alpha+\beta}{2} + y\sin\frac{\alpha+\beta}{2} = 0$

Answer: C

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43. A straight line $x - 2y - 4 = 0$ is shifted parallel to it by 3 units away from the origin and then rotated by an angle of 30° in the anti-clockwise direction.If the slope of the new line formed is m, then the integral part of 'm' is

A. -1

B. 0

C. 1

D. 2

Answer: C

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44. A straight line $x - 2y - 4 = 0$ is shifted parallel to it by 3 units away from the origin and then rotated by an angle of 30° in the anti-clockwise direction.If the slope of the new line formed is m, then the integral part of 'm' is

A. $-\frac{13\pi}{12}$

B. $\frac{29\pi}{12}$

C. $-\frac{11\pi}{12}$

D. $\frac{35\pi}{12}$

Answer: D

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45. The straight lines $x+3y-4=0, x+y-4=0$ and $3x+y-4=0$

A. from an isosceles triangle

B. are concurrent

C. from an equilateral triangle

D. from a right angled isosceles triangle

Answer: A

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46. The combined eqyation of the straight lines passing through (1, 1) and making an angle of 45° with the straight line $x+y-1=0$ is

A. $2x^2+3xy-2y^2-7x+y+1=0$

B. $xy-x-y+1=0$

C. $xy+2y^2-x-5y-3=0$

D. $2x^2 - xy - 3x + y + 1 = 0$

Answer: B

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47. The centroid of the triangle formed by the pair of straight lines $12x^2 - 20xy + 7y^2 = 0$ and the line $2x - 3y + 4 = 0$ is (α, β). Then, $\alpha + 2\beta =$

A. $-\frac{4}{3}$

B. 2

C. 8

D. $-\frac{8}{3}$

Answer: C

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48. The equation of the bisectors of the angles between the lines joining the origin to the points of intersection of the curve $x^2 + xy + y^2 + x + 3y + 1 = 0$ and the line x + y + 2 = 0 is

A. $2x^2 - 4xy + y^2 = 0$

B. $x^2 - 4xy + y^2 = 0$

C. $2x^2 + 4xy + y^2 = 0$

D. $x^2 + 4xy - y^2 = 0$

Answer: D

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49. Consider the following statementas.

I. The intercept made by the circle $x^2 + y^2 - 2x - 4y + 1 = 0$ on Y- axis is $2\sqrt{3}$

II. The intercept made by the circle $x^2 + y^2 - 4x - 2y + 6 = 0$ on X-axis is $2\sqrt{2}$

III. The straight line $y = 2x + 1$ cuts the circle br $x^2 + y^2 = 9$ at two distinct points

Then which one of the following option is correct?

A. $\begin{matrix} I & II & III \\ \text{True} & \text{True} & \text{True} \end{matrix}$

B. $\begin{matrix} I & II & III \\ \text{True} & \text{True} & \text{False} \end{matrix}$

C. $\begin{matrix} I & II & III \\ \text{True} & \text{False} & \text{True} \end{matrix}$

D. $\begin{matrix} I & II & III \\ \text{False} & \text{False} & \text{True} \end{matrix}$

Answer: C

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50. If the circle $x^2 + y^2 + 2kx - 4y + 1 = 0$ and $x^2 + y(2) - 8x - 12y + 43 = 0$ touch e

A. 2

B. 1

C. -1

D. -2

Answer: C

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51. For all real values of k, the point which lies on the polar of $(k, k+1)$ with respect to the circle

$x^2 + y^2 + 4x - 8y - 5 = 0$ is

A. $(3, -1)$

B. $(3, 1)$

C. $(2, -2)$

D. $(2, 3)$

Answer: A

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52. The number of common tangents to the circles

$x^2 + y^2 + 4x = 0$ and $x^2 + y^2 - 2x = 0$ is

A. 4

B. 3

C. 2

D. 1

Answer: B

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53. If $\frac{2}{\sqrt{5}}$ is the length of the common chord of the circles $x^2 + y^2 + 2x + 2y + 1 = 0$ and $x^2 + y^2 + \alpha x + 3y + 2 = 0, \alpha \neq 0,$ then $\alpha =$

A. 4

B. 3

C. 2

D. 1

Answer: A

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54. Match the item of list-I with those of List-II

List-I	List-II
A Equation of the tangent drawn at $(2, \sqrt{8})$ on the curve $y^2 = 4x$ is	(i) -36
B Equation of the normal to the curve $y^2 = 16x$, that makes and angle of 45° with its axis is	(ii) 4
C The chord joining the points (x_1, y_1) and (x_2, y_2) on the curve $y^2 = 12x$ is a focal chord if $y_1 y_2 =$	(iii) 8
D A value of k for which $x - 3 = 0$ is the directrix of the curve $y^2 - kx + 16 = 0$ is	(iv) $x - \sqrt{2}y + 2 = 0$
	(v) $x + y - 12 = 0$
	(vi) $x - y - 12 = 0$

Then, which of the following is correct ?

A. $\begin{matrix} A & B & C & D \\ v & iv & iii & ii \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ iv & v & ii & i \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ iv & vi & i & ii \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ iv & vi & ii & iii \end{matrix}$

Answer: C

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55. An equilateral is inscribed in the parabola $y^2 = 8x$ with one of its vertices is the vertex of the parabola. Then the length of the side of that triangle is

A. $(8a, 0)$

B. $(16a, 0)$

C. $(32a, 0)$

D. $(48a, 0)$

Answer: C

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56. If the straight line $8x + 3\sqrt{2}y = 36$ touches the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 2$ at (a, b),then $a + \sqrt{2b} =$

A. $\frac{36}{5\sqrt{2}}$

B. $\frac{8}{3}$

C. $\frac{12 + 2\sqrt{2}}{3}$

D. $\frac{16}{3}$

Answer: D

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57. The eccentricity of an ellipse, with its centre at the origin, is 1/2. If one of the directrices is x = 4, then the equation of the ellipse is

A. $3x^2 + 4y^2 = 12$

B. $3x^2 + 4y^2 = 49$

C. $3x^2 + 4y^2 = 1$

D. $4x^2 + 3y^2 = 12$

Answer: A

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58. If the product of the slopes of the tangents drawn from an external point P to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is a constant k^2, then the locus of P is

A. $y^2 + b^2 = k^2(x^2 - a^2)$

B. $y^2 - b^2 = k^2(x^2 - a^2)$

C. $x^2 + b^2 = k^2(y^2 - a^2)$

D. $x^2 - b^2 = k^2(y^2 - a^2)$

Answer: A

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59. Let A, B, C be three points on $\overline{OX}, \overline{OY}, \overline{OZ}$ respectively at the distances 3, 6, 9 from origin.

Let Q be the point (2, 5, 8) and P be the point equidistant from O,A,B,C.Them,the coordinates of the point R which divides PQ in the ratio : 2 is

A. $\left(\frac{17}{10}, \frac{29}{5}, \frac{43}{10}\right)$

B. $\left(\frac{7}{5}, \frac{16}{5}, 5\right)$

C. $\left(\frac{9}{5}, \frac{21}{5}, \frac{33}{5}\right)$

D. $\left(\frac{8}{5}, \frac{19}{5}, 6\right)$

Answer: C

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60. If the direction cosines of two lines are such

that $l + m + n = 0, l^2 + m^2 - n^2 = 0$, then the angle between them is

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

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

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: C

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61. If the line joining the points A (1, 0, 0) and B(0, 0, 1) is a normal to the plane (π)which passes through the point A, them the angle between the planes (π) and $x + y + z = 6$ is

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

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

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: A

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62. The number of points at which the funtion $f(x)=\frac{\sqrt{11+|x|-6\sqrt{2+|x|}}}{6-2\sqrt{2+|x|}}$ is discontinuous in $(-\infty, \infty)$ is

A. 1

B. 0

C. 2

D. 3

Answer: C

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63. If $f(x)=\begin{cases}\frac{\sqrt{1+px}-\sqrt{1-px}}{x}, & -1\le x<0\\ \frac{2x+1}{x-2}, & 0\le x\le 1\end{cases}$

continauous on [-1,1], then p =

A. $-\frac{1}{2}$

B. $-\frac{1}{4}$

C. $\frac{1}{2}$

D. 2

Answer: A

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64. If $y=\tan^{-1}(\sin\sqrt{x})+\operatorname{cosec}^{-1}(e^{2x+1}),\quad \text{then } \frac{dy}{dx}=$

A. $\frac{1}{\sqrt{x}(1+\sin^2\sqrt{x})}+\frac{1}{\sqrt{e^{4x+2}+1}}$

B. $\frac{\cos\sqrt{x}}{2\sqrt{x}(1+\sin^2\sqrt{x})}-\frac{2}{\sqrt{e^{4X+2}-1}}$

C. $\dfrac{\cos\sqrt{x}}{\left(1+\sin^2\sqrt{x}\right)}+\dfrac{2}{\sqrt{e^{4X+2}+1}}$

D. $\dfrac{1}{2\sqrt{x}}\dfrac{\cos\sqrt{x}}{1+\sin^2\sqrt{x}}-\dfrac{1}{\sqrt{e^{2X+1}-1}}$

Answer: B

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65. If f : $R \to R$ is such that $f(3)=16, f'(3)=4,$ then $\lim_{x\to 3}\dfrac{xf(3)-3f(x)}{x-3}=$

A. 4

B. 6

C. 8

D. 12

Answer: A

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66. If $y = e^x(\log x), \quad \text{then} \quad xy_2 + (x - 1)y =$

A. $(2x - 1)y_1$

B. $(x - 1)y_1$

C. $(4 - 2x)y_1$

D. $(3x - 1)y_1$

Answer: A

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67. Let $f(x) = e^x \cos x + 1$. Which of the following statements is always true?

A. Between any two consecutive roots of $f(x) = 0$

there is always a root of $e^x \sin x + 1 = 0$

B. Between any two consecutive roots of $f(x) = 0$

there is always a root of $e^x \sin x - 1 = 0$

C. Between any two consecutive roots of $f(x) = 0$

there is always a root of $e^x \cos x = 0$

D. Between any two consecutive roots of $f(x) = 0$

there is always a roots of $e^x \sin x = 0$

Answer: D

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68. The radius of a circular plate is increasing at the rate of 0.01 cm/sec when the radius is 12 cm. Then the rate at which the area increases is

A. 60π

B. 24π

C. 1.2π

D. 0.24π

Answer: B

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69. Let $f(x) = x^2 e^{-2x}, x > 0.$ The maximum value of f(x) is

A. 0

B. $\frac{1}{e^2}$

C. $\frac{1}{4e^2}$

D. $\frac{1}{2e}$

Answer: B

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70. Let f(x) be differentible on [1, 6] and $f(1) = -2.$

If f(x)has only one root in (1, 6) then there exists c $\in (1, 6)$ such that

A. $f'(c) = \frac{1}{10}$

B. $f'(c) < \frac{2}{5}$

C. $f'(c) < \frac{1}{5}$

D. $f'(c) > \frac{2}{5}$

Answer: D

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71. If $\int \phi(x)dx = \Psi(x), \quad \text{then} \quad \int (\phi_\circ h)(x)h(x)h'(x)dx =$

A. $(\phi_\circ h)(x)\phi'(x) - \int (\phi_\circ h)(x)h'(x)dx + c$

B. $(\Psi_\circ h)(x)h(x) - \int (\Psi_\circ h)(x)h'(x)dx + c$

C. $(\Psi_\circ h)(x)\phi(x) - \int (\Psi_\circ h)(x)\phi'(x)dx + c$

D. $(\Psi_\circ \Phi)(x)h(x) - \int (\Psi_\circ \phi)(x)h'(x)dx + c$

Answer: B

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72. If $f\left(\frac{t+1}{2t+1}\right)=t+1$, then $\int f(x)dx=$

A. $\frac{x^2}{2}+c$

B. $\log(2x-1)+\frac{1}{2}\log(x+1)+c$

C. $\frac{1}{2}\log(2x-1)+c$

D. $\frac{x}{2}+\frac{1}{4}\log(2x-1)+c$

Answer: D

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73. $\int\frac{x^8-9x^2+18}{x^4-3x^2+13}dx=$

A. $\frac{X^4}{4}+X^3+6X^2+c$

B. $\frac{X^5}{5}+\frac{X^4}{4}+6X+c$

C. $\frac{X^5}{5}+X^3+6X+c$

D. $\frac{X^5}{5}+X^3+6X+c$

Answer: C

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74. $\int (\cot x \cot(x+\alpha)+1)dx =$

A. $\cot\alpha \log\left(\left|\frac{\sin x}{\sin(x+\alpha)}\right|\right)+c$

B. $\log|\sin x \sin(x+\alpha)|+x+c$

C. $\log|\sin x \cos(x+\alpha)|+x+c$

D. $\tan\alpha \log\left(\left|\frac{\cos x}{\sin(X+\alpha)}\right|\right)+c$

Answer: A

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75. If $\lim_{n \to \infty} \sum_{r=1}^{n} \frac{4r^3}{r^{4+n^4}} =$ p, then $e^4 =$

A. 4

B. 3

C. 2

D. 1

Answer: C

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76. $\int_0^{\pi/4}\left[\sqrt{\frac{1-\sin 2x}{1+\sin 2x}}dx=\right.$

A. 1

B. 2log2

C. $2\log\sqrt{2}$

D. 2

Answer: D

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77. The area bounded by the curve

$y = x^3 - 3x^2 + 2x$ and the X-axis is (in square units)

A. $\frac{1}{2}$

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

C. 1

D. 4

Answer: A

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78. The general solution of the differential equation $\cos(x+y)dy = dx$ is

A. $y = \sec(x+y) + c$

B. $y - \tan\frac{y}{2} = x + c$

C. $y = \tan\left(\frac{x+y}{2}\right) + c$

D. $y=\frac{1}{2}\tan(x+y)+c$

Answer: C

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79. The general solution of the differential equation $(x^3-3xy^2)dx=(y^3-3x^2y)dy$ is where c is an arbitrary constant

A. $c^2(X^2+y^2)=(y^2-X^2)$

B. $c^2(X^2+y^2)=(y^2-X^2)$

C. $c^2(X^2+y^2)^2=(y^2-X^2)$

D. $c^2(X^2-y^2)^2=(y^2-X^2)$

Answer: C

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80. The differential equation corresponding to all the circle lting in the first quadrant and touching the coordinate axes is

A. $(x-y)^2\left[1+\left(\frac{dy}{dx}\right)^2\right]=\left(x+y\frac{dy}{dx}\right)^2$

B. $(x-y)^2\left[1+\frac{dy}{dx}\right]^2=\left(x+y\frac{dy}{dx}\right)^2$

C. $(x-y)^2\left[1+\left(\frac{dy}{dx}\right)^2\right]=x+y\left(\frac{dy}{dx}\right)^2$

D. $(x-y)^2\left[1+\frac{dy}{dx}\right]=\left(x+y\frac{dy}{dx}\right)^{\frac{1}{2}}$

Answer: A

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81. If $f: R \rightarrow R$ is defined by f(x)=[2x]-2[x] for $x \in R$, then the range of f is (Here [x] denotes the greatest integer not exceding x)

A. Z, the set of all integers

B. N, the set of all natural numbers

C. R the set of all real numbers

D. (0,1)

Answer: D

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82. Given that a,b and c are real numbers such that $b^2 = 4ac$ and $a > 0$.

The maximal possible set $D \subset R$ on which the function $f: D \to R$ given by

$f(x) = \log\left(ax^3 + (a+b)x^2 + (b+c)x + c\right)$ is defined, is

A. $R - \left\{-\frac{b}{2a}\right\}$

B. $R - \left(\left\{-\frac{b}{2a}\right\} \cup (-\infty - 1)\right)$

C. $R - \left(\left\{-\frac{b}{2a}\right\} \cup (x, x \geq 1)\right)$

D. $R - (\{-bl2a\} \cup (-\infty - 1))$

Answer: D

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83. For any natural number n, $(15 \times 5^{2n}) + (2 \times 2^{3n})$ is divisible by

A. 7

B. 11

C. 13

D. 17

Answer: D

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84. For the matrix $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} A^{-1} =$

A. A

B. A^2

C. A^3

D. A^4

Answer: C

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85. $A = \begin{bmatrix} k/2 & 0 & 0 \\ 0 & l/3 & 0 \\ 0 & 0 & m/4 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1/3 & 0 \\ 0 & 0 & 1/4 \end{bmatrix}$, then

k+l+m=

A. 1

B. 9

C. 14

D. 29

Answer: D

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86. If A and B are the two real values of k for which the system of equations $x+2y+z=1, x+3y+4z=k, x+5y+10z=k^2$ is consistent, then A+B =

A. 3

B. 4

C. 5

D. 7

Answer: A

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87. Let z=x+iy and a point P represent z in the Argand plane. If the real part of $\frac{z-1}{z+i}$ is 1, then a point that lies on the locus of P is

A. (2016, 2017)

B. (-2016, 2017)

C. (-2016, -2017)

D. (2016, -2017)

Answer: D

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88. If $13e^{i\tan^{-1}\frac{5}{12}} = a + ib$, then the ordered pair (a,b) =

A. (12,5)

B. (5,12)

C. (24,10)

D. (10,24)

Answer: A

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89. If $z_1 = 1 - 2i$, $z_2 = 1 + i$ and $z_3 = 3 + 4i$, then $\left(\frac{1}{z_1} + \frac{3}{z_2}\right)\frac{z_3}{z_2} =$

A. 13-6i

B. 13-3i

C. $6 - \frac{13}{2}i$

D. $\frac{13}{2} - 3i$

Answer: D

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90. If $1, \omega, \omega^2$ are the cube roots of unity, then prove that $\frac{1}{2+\omega} - \frac{1}{1+2\omega} = \frac{1}{1+\omega}$.

A. 1

B. ω

C. ω^2

D. 0

Answer: D

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91. The number of integral vaules of x satisfying $5x - 1 < (x+1)^2 < 7x - 3$ is

A. 0

B. 1

C. 2

D. 3

Answer: B

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92. For real number x, if the minimum value of $f(x) = x^2 + 2bx + 2c^2$ is greater than the maximum value of $g(x) = -x^2 - 2cx + b^2$, then

A. $c^2 > 2b^2$

B. $c^2 < 2b^2$

C. $b^2 = 2c^2$

D. $c^2 = 2b^2$

Answer: A

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93. If a,b and c are the roots of $x^3 + qx + r = 0$, then $(a-b)^2 + (b-c)^2 + (c-a)^2$=

A. $-6q$

B. $-4q$

C. 6q

D. 4q

Answer: A

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94. If the sum of two roots of the equation $x^3 - 2px^2 + 3qx - 4r = 0$ is zero, then the value of r is

A. $\frac{3\rho q}{2}$

B. $\frac{3\rho q}{4}$

C. ρq

D. $2\rho q$

Answer: A

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95. The sum of the four digit even numbers that can be formed with the digits 0,3,5,4 with out repetition is

A. 14684

B. 43536

C. 46526

D. 52336

Answer: B

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96. If x is the number of ways in which six women and six men can be arranged to sit in a row such that no two women are together and if y is the number of ways they are seated around a table in the same manner, then x:y=

A. $12 : 1$

B. $42 : 1$

C. $16 : 1$

D. $6 : 1$

Answer: B

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97. The number of 5-letter words that can be formed by using the letters of the word SARANAM is

A. 1120

B. 6720

C. 480

D. 720

Answer: C

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98. The number of rational terms in the binomial expansion of $\left(\sqrt[4]{5}+\sqrt[5]{4}\right)^{100}$ is

A. 50

B. 5

C. 6

D. 51

Answer: C

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99. The numerically greatest term in the binomial expansion of $(2a-3b)^{19}$ when $a=\frac{1}{4}$ and $b=\frac{2}{3}$ is

A. ${}^{19}C_5, 2^{11}$

B. ${}^{19}C_3, 2\frac{1}{11}$

C. ${}^{19}C_4, 2\frac{1}{13}$

D. ${}^{19}C_3, 2^{13}$

Answer: D

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100. If $\frac{x^2+5x+7}{(x-3)^3} = \frac{A}{(x-3)} + \frac{B}{(x-3)^2} + \frac{C}{(x-3)^3}$, then the equation of the line having slope A and passing through the point (B,C) is

A. $x+y-20=0$

B. $x-y+20=0$

C. $x+y+20=0$

D. $x-y-20=0$

Answer: B

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101. If $\left(x - \frac{\pi}{3}\right)$, $\cos x \cos\left(x + \frac{\pi}{3}\right)$ are in a harmonic progression, then cos x=

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

B. 1

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

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

Answer: D

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102. $\cos^3 110^\circ + \cos^3 10^\circ + \cos^3 130^\circ =$

A. $\frac{3}{4}$

B. $\frac{3}{8}$

C. $\frac{3\sqrt{3}}{8}$

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

Answer: C

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103. If the general solution of $\sin 5x = \cos 2x$ is of the form $a_n, \frac{\pi}{2}$ or $n = 0, \pm 1, \pm 2, \ldots,$ then $a_n =$

A. $\frac{2n}{5 + 2(-1)^n}$

B. $\frac{2n + (-1)^n}{5 + 2(-1)^n}$

C. $\frac{2n + 1}{5 + 2(-1)}$

D. $\frac{2n - 1}{5 + 2(-1)^n}$

Answer: B

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104. $ax + b(\sec(\tan^{-1} x)) = c$ and $ay + b(\sec(\tan^{-1} y)) = c$

The value of $\frac{x + y}{1 - xy}$ is

A. $\dfrac{2ab}{a^2-b^2}$

B. $\dfrac{2ac}{a^2+c^2}$

C. $\dfrac{2ab}{a^2+b^2}$

D. $\dfrac{2ac}{a^2-c^2}$

Answer: D

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105. $\tan h^{-1}\dfrac{1}{2}+\cot h^{-1}3=$

A. $\log\sqrt{6}$

B. log 6

C. $-\log\sqrt{6}$

D. $-\log 6$

Answer: A

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106. If the median of a ΔABC through A is perpendicular to AC, then $\frac{\tan A}{\tan C}$=

A. $1+\sqrt{2}$

B. $-\frac{1}{\sqrt{3}}+1$

C. -2

D. $1+\frac{2}{\sqrt{3}}$

Answer: C

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107. In $\Delta ABC, \tan\frac{A}{2}+\tan\frac{B}{2}=$

A. $\frac{c\cot\frac{C}{2}}{4s}$

B. $\frac{2c\cot\frac{C}{2}}{a+b+c}$

C. $\frac{2c\tan\frac{C}{2}}{s}$

D. $\frac{c\tan\frac{C}{2}}{a+b+c}$

Answer: B

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108. In a ΔABC, D, E and F respectively are the points of contact of the incircle with the sides AB, BC and CA such that $AD=\alpha$, $BE=\beta$ and $CF=\gamma$, then $\frac{\alpha\beta\gamma}{\alpha+\beta+\gamma}=$

A. R^2

B. 2R

C. 2r

D. r^2

Answer: D

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109. Let a,b and c be three non-coplanar vectors. The vector equation of a line which passes through the point of intersection of two lines, one joining the points a+2b-5c, -a-2b-3c and the other joining the points -4c, 6a-4b+4c is

A. $r = 2a - 4b + 3c + \mu(a - 6b + 4c)$

B. $r = 3a + 6b - c + \mu(a + 2b + c)$

C. $r = 2a + 3b - c + \mu(a + b + c)$

D. $r = \ - 2b + 3c + \mu(a - 4b + 3c)$

Answer: B

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110. In ΔPQR, M is the mid-point of QR and C is the mid-point of PM. If QC when extended meets PR at N, then $\left|\frac{\overline{QN}}{\overline{CN}}\right| =$

A. 1

B. 2

C. 3

D. 4

Answer: D

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111. If $a = \hat{i} - 2\hat{j} - 3\hat{k}, b = 2\hat{i} + \hat{j} - k, c = \hat{i} + 3\hat{j} - 2\hat{k},$ then $[(a \times b) \times (b \times c)(b \times c) \times (c \times a)(c \times a) \times (a \times b)] =$

A. 160000

B. -8000

C. 400

D. -40

Answer: A

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112. If $a = \hat{i} + 2\hat{j} + 3\hat{k}, b = -\hat{i} + 2\hat{j} + \hat{k}, c = \hat{i} + 2\hat{j} - 2\hat{k}, n$ is perpendicular to both a and b and θ is the angle between c and n then $\sin\theta =$

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

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

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

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

Answer: B

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113. If a, b and c are mutually perpendicular vectors of the same magnitude, then the cosine of the angle between a and a +b+c is

A. $\frac{1}{\sqrt{2}}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{1}{2}$

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

Answer: B

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114. It a,b and c are non-coplanar vectors and the four points with position vectors $2a+3b-c, a-2b+3c, 3a+4b-2c$ and $ka-6b+6c$ are coplanar, then k=

A. 0

B. 1

C. 2

D. 3

Answer: B

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115. The mean and the standard deviation of data of 8 items are 25 and 5 respectively. If two items 15 and 25 are added to this data, then the variance of the new data is

A. 29

B. 24

C. 26

D. $\sqrt{29}$

Answer: A

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116. A die is rolled three times, the probability of getting a larger number than the previous number each time is

A. $\frac{15}{216}$

B. $\frac{5}{54}$

C. $\frac{13}{216}$

D. $\frac{1}{18}$

Answer: B

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117. A man is known to speack the truth 2 out of 3 times . He throws a die and reports that it is a six . The probability that it is actually a six is

A. $\frac{3}{8}$

B. $\frac{1}{7}$

C. $\frac{2}{7}$

D. $\frac{4}{5}$

Answer: B

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118. If the probability function of a random variable X is defined by $P(X=k)=a\left(\frac{k+1}{2^k}\right)$ for k=0,1,2,3,4,5, then the probability that X takes a prime value is

A. $\frac{13}{20}$

B. $\frac{23}{60}$

C. $\frac{11}{20}$

D. $\frac{19}{60}$

Answer: B

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119. If X is a binomial variate with mean 6 and variance 2, then the value of $P(5 \leq X \leq 7)$ is

A. $\frac{4762}{6561}$

B. $\frac{4672}{6561}$

C. $\frac{5264}{6561}$

D. $\frac{5462}{6651}$

Answer: B

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120. Let A(2,3), B(3,-6), C(5,-7) be three points. If P is a point satisfying the condition $PA^2 + PB^2 = 2PC^2$, then a point that lies on the locus of P is

A. $(2, -5)$

B. $(-2, 5)$

C. $(13, 10)$

D. $(-13, -10)$

Answer: D

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121. If the coordinates of a point P changes to (2,-6) when the coordinate axes are rotated through an angle of 135°, then the coordinates of P in the original system are

A. $(-2, 6)$

B. $(-6, 2)$

C. $(2\sqrt{2}, 4\sqrt{2})$

D. $(\sqrt{2} - \sqrt{2})$

Answer: C

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122. If the portion of a line intercepted between the coordinates axes is divided by the point (2,-1) in the ratio of 3:2, then the equation of that line is

A. $5x - 2y - 20 = 0$

B. $2x - y - 5 = 0$

C. $3x - y - 7 = 0$

D. $x - 3y - 5 = 0$

Answer: D

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123. The equation of the line passing through the point of intersection of the lines $2x + y - 4 = 0$, $x - 3y + 5 = 0$ and lying at a distance of $\sqrt{5}$ units from the origin, is

A. $x - 2y - 5 = 0$

B. $x + 2y - 5 = 0$

C. $x + 2y + 5 = 0$

D. $x - 2y + 5 = 0$

Answer: B

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124. The equation of the line joining the centroid with the orthocentre of the triangle formed by the points $(-2, 3), (2, -1), (4, 0)$ is

A. $x + y - 2 = 0$

B. $11x - y - 14 = 0$

C. $x - 11y + 6 = 0$

D. $2x - y - 2 = 0$

Answer: B

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125. The lines represented by the equations $23x^2 - 48xy + 3y^2 = 0$ and $2x + 3y + 4 = 0$ form

A. an isosceies triangle

B. a right angied triangle

C. an equilateral triangle

D. a scalene triangle

Answer: C

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126. If the line x+2y=k intersects the curve $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ at two points A and B and if O is the origin. Then the condition for $\angle AOB = 90^\circ$ is

A. $k^2 + k + 1 = 0$

B. $k^2 - 2k + 10 = 0$

C. $2k^2 + 9k - 10 = 0$

D. $3k^2 + 8k - 1 = 0$

Answer: C

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127. If $2x^2 + 3xy - 2y^2 = 0$ represents two sides of a parallelogram and 3x+y+1=0 is one of its diagonals, then the other diagonal is

A. $x - 3y + 1 = 0$

B. $x - 3y + 2 = 0$

C. $x - 3y = 0$

D. $3x - y = 0$

Answer: C

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128. If the lengths of the tangents drawn from P to the circles $x^2 + y^2 - 2x + 4y - 20 = 0$ and $x^2 + y^2 - 2x - 8y + 1 = 0$ are in the ratio 2:1, then the locus P is

A. $x^2 + y^2 + 2x + 12y + 8 = 0$

B. $x^2 + y^2 - 2x + 12y + 8 = 0$

C. $x^2 + y^2 + 2x - 12y + 8 = 0$

D. $x^2 + y^2 - 2x - 12y + 8 = 0$

Answer: D

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129. The equation of a circle touching the coordinate axes and the line $3x - 4y = 12$ is

A. $x^2 + y^2 + 6x + 6y + 9 = 0$

B. $x^2+y^2+6x+6y-9=0$

C. $x^2+y^2-6x-6y+9=0$

D. $x^2+y^2-6x-6y-9=0$

Answer: C

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130. The pole of the straight line 9x+y-28=0 with respect to the circle

$2x^2+2y^2-3x+5y-7=0$ is

A. (3,1)

B. (3,-1)

C. (-3,1)

D. (4,-8)

Answer: B

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131. The point of intersection of the direct common tangents drawn to the circles $(x+11)^2+(y-2)^2=225$ and $(x-11)^2+(y+2)^2=25$ is

A. $\left(\frac{-11}{2}1\right)$

B. $(-22, 4)$

C. $\left(\frac{11}{2}, -1\right)$

D. `(22,-4)

Answer: D

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132. If the radical axis of the circles $x^2+y^2+2gx+2fy+c=0$ and $2x^2+2y^2+3x+8y+2c=0$ touches the circle $x^2+y^2+2x+2y+1=0$, then $(4g-3)(f-2)=$

A. $g = \frac{3}{4}$ or f $= 2$

B. $g \neq \frac{3}{4}, f = 2$

C. $g = \frac{3}{4}$ or f $\neq 2$

D. $g = \frac{2}{5}$ or f $= 1$

Answer: A

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133. The line y=6x+1 touches the parabola $y^2 = 24x$. The coordinates of a point P on this line, from which the tangent to $y^2 = 24x$ is perpendicular to the line y=6x+1. is

A. (-1,-5)

B. (-2,-11)

C. (-6,-35)

D. (-7,-41)

Answer: C

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134. A point on the parabola whose focus is S(1,-1) and whose vertex is A (1,1) is

A. $\left(3, \frac{1}{2}\right)$

B. $(1, 2)$

C. $\left(2, \frac{1}{2}\right)$

D. $(2, 2)$

Answer: D

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135. An ellipse having the coordinate axes as its axes and its major axis along Y-axis, passes through the point (-3,1) and has eccentricity $\sqrt{\frac{2}{5}}$.

Then its equation is

A. $3x^2 + 5y^2 - 15 = 0$

B. $5x^2 + 3y^2 - 32 = 0$

C. $3x^2 + 5y^2 - 32 = 0$

D. $5x^2 + 3y^2 - 48 = 0$

Answer: C

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136. The product of the perpendicular distances drawn from the points (3,0) and (-3,0) to the tangent of the ellipse $\frac{x^2}{36} + \frac{y^2}{27} = 1$ at $\left(3, \frac{9}{2}\right)$ is

A. 36

B. 27

C. 9

D. 63

Answer: B

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137. The equation of the hyperbola whose asymptotes are 3x+4y-2=0, 2x+y+1=0 and which passes through the point (1, 1) is

A. $6x^2 + 11xy + 4y^2 - 30x + 2y + 7 = 0$

B. $6x^2 + 11xy + 4y^2 - x + 2y - 22 = 0$

C. $6x^2 + 11xy + 4y^2 - x + 2y + 22 = 0$

D. $6x^2 + 11xy + 4y^2 - 3x - 7y - 11 = 0$

Answer: B

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138. If the orthocentre and the centroid of a triangle are (-3,5,2) and (3,3,4) respectively, then its circumentre is

A. (6,2,5)

B. (6,2,-5)

C. (6,-2,5)

D. (6,-2,-5)

Answer: A

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139. A plane cuts the coordinate axes X,Y,Z at A,B,C respectively such that the centroid of the ΔABC is (6,6,3). Then the equation of that plane is

A. $x+y+z-6=0$

B. $x+2y+z-18=0$

C. $2x+y+z-18=0$

D. $x + y + 2z - 18 = 0$

Answer: D

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140. If the foot of the perpendicular drawn from the origin to a plane is (1,2,3), then a point on that plane is

A. (3,2,1)

B. (7,2,1)

C. (7,3,-1)

D. (6,-3,4)

Answer: B

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141. If [x] denotes the greatest integer $\leq x$, then $\lim_{n \to \infty} \frac{1}{n^3}\{[1^2x] + [2^2x] + [3^2x] + ... + [n^2x]\} =$

A. $\frac{x}{2}$

B. $\frac{x}{3}$

C. $\frac{x}{6}$

D. 0

Answer: B

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142. $f(x) = \begin{cases} \frac{1-\sqrt{2}\sin x}{\pi - 4x} & \text{if } x \neq \frac{\pi}{4} \\ \text{k} & \text{if } x = \frac{\pi}{4} \end{cases}$

continous at x=(pi)/(4)`, then K=

A. $\frac{1}{4}$

B. 1

C. $\frac{-1}{4}$

D. 2

Answer: A

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143. The derivative of $f(x)=x^{\tan^{-1}x}$ with respect to $g(x)=\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ is

A. $\frac{1}{2}\sqrt{1-x^2}x^{\tan^{-1}x}\left[\frac{\log x}{1+x^2}+\frac{\tan^{-1}x}{x}\right]$

B. $-\frac{1}{2}\sqrt{1-x^2}x^{\tan^{-1}x}\left[\log(\tan^{-1}x)+x(1+x^2)\tan^{-1}x\right]$

C. $\frac{-2\tan^{-1^x}\left[\frac{\log x}{1+x^2}+\frac{\tan^{-1}x}{x}\right]}{\sqrt{1-x^2}}$

D. $-\frac{1}{2}\sqrt{1-x^2}x^{\tan^{x^{-1}}}\left[\frac{\log x}{1+x^2}+\frac{\tan^{-1}x}{x}\right]$

Answer: D

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144. If x=3 cos t and y = 4 sin t, then $\frac{d^2y}{dx^2}$ at the point $(x_0, y_0) = \left(\frac{3}{2}\sqrt{2}, 2\sqrt{2}\right)$, is

A. $\frac{4\sqrt{2}}{9}$

B. $-\frac{4\sqrt{2}}{9}$

C. $\frac{8\sqrt{2}}{9}$

D. $-\frac{8\sqrt{2}}{9}$

Answer: D

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145. If $y = \frac{2}{\sqrt{a^2 - b^2}}\tan^{-1}\left[\sqrt{\frac{a-b}{a+b}}\tan\frac{x}{2}\right]$

A. $\frac{d^2y}{dx^2}\Big|_{x=\frac{\pi}{2}} =$

B. $\frac{b}{2a^2}$

C. $\frac{b}{a^2}$

D. $\frac{2b}{a}$

Answer: B

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146. If $f(x) = x^3 + ax^2 + bx + 5\sin^2 x$ is an increasing function on R, then

A. $a^2 - 3b - 15 < 0$

B. $a^2 - 3b + 15 < 0$

C. $a^2 - 3b - 15 > 0$

D. $a^2 + 3b + 15 > 0$

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147. The approximate value of $\cos 31^\circ$ is (Take $1^\circ = 0.0174$)

A. 0.7521

B. 0.866

C. 0.7146

D. 0.8573

Answer: D

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148. If x and y are two positive numbers such that x+y=32, then the minimum value of $x^2 + y^2$ is,

A. 500

B. 256

C. 1024

D. 512

Answer: D

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149. The constant'c of Lagrange's mean value theorem for the function $f(x) = \frac{2x+3}{4x-1}$ defined on [1,2] is

A. $\frac{1+\sqrt{15}}{3}$

B. $\frac{1+\sqrt{21}}{4}$

C. $\frac{5}{3}$

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

Answer: B

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150. $\int \frac{\sin 2x dx}{\sin^4 x + \cos^4 x} = \tan^{-1}(f(x)) + c, \quad \text{then} \quad f\left(\frac{\pi}{3}\right) =$

A. 1

B. 2

C. 3

D. $\frac{1}{3}$

Answer: C

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151. $\int \left\{ \frac{(\log x - 1)}{\left(1 + (\log x)^2\right)} \right\}^2 dx =$

A. $\frac{\log x}{1 + (\log x)^2} + c$

B. $\frac{x}{x^2 + 1} + c$

C. $\frac{x}{1 + (\log x)^2} + c$

D. $\frac{-x}{1 + (\log x)^2} + c$

Answer: C

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152. $\int \frac{dx}{x^3 + 3x^2 + 2x} =$

A. $\log|x| - \log|x+1| + \log|x+2| + c$

B. $\log|x| - \log|x+1| + \log|x+2| + c$

C. $\frac{1}{2}[\log|x| + \log|x+1| + \log|x+2| + c$

D. $\frac{1}{2}\log\left(\frac{[x^2+2x]}{(x+1)^2}\right) + c$

Answer: D

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153. For $n \geq 2$, If $I_n = \int \sec^n x dx, \quad \text{then} \quad I_4 - \frac{2}{3}I_2 =$

A. $\sec^2 x \tan x + c$

B. $\frac{1}{3}\sec^2 x \tan x + c$

C. $\frac{2}{3}\sec^2 x \tan x + c$

D. $\frac{1}{2}\log|\sec x + \tan x| + c$

Answer: B

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154. $\underset{n \to \infty}{Lt}\left(\frac{\sqrt{1}+2\sqrt{2}+3\sqrt{3}+ \dots\dots + n\sqrt{n}}{n^{5/2}}\right)=$

A. 1

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

C. 0

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

Answer: D

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155. $\int_0^{\alpha/3}\frac{f(x)}{f(x)+f\left(\frac{\alpha-3x}{3}\right)}dx =$

A. $\frac{2\alpha}{3}$

B. $\frac{\alpha}{2}$

C. $\frac{\alpha}{3}$

D. $\frac{\alpha}{6}$

Answer: D

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156. The area (in sq. units) of the region bounded by the X-axis and the curve $y = 1 - x - 6x^2$ is

A. $\frac{125}{216}$

B. $\frac{125}{512}$

C. $\frac{25}{216}$

D. $\frac{25}{512}$

Answer: A

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157. If m and n are respectively the order an degree of the differential equation of the family of parabolas with focus at the origin and X-axis as its axis, then mn-m+n=

A. 1

B. 4

C. 3

D. 2

Answer: C

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158. Solve $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0$

A. $Ye^{\frac{y}{x}}+x=c$

B. $ye^{\frac{x}{y}} - x = c$

C. $ye^{\frac{x}{y}} + y = c$

D. $ye^{\frac{x}{y}} + x = c$

Answer: D

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159. If $f: R \to [-1, 1]$ and g : $R \to A$ are two surjective mappings and $\sin\left(g(x) - \frac{\pi}{3}\right) = \frac{f(x)}{2}\sqrt{4 - f^2(x)}$, then A =

A. $\left[0, \frac{2\pi}{3}\right]$

B. $[-1, 1]$

C. $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

D. $(0, \pi)$

Answer: A

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160. The domain of the funciton $f(x) = \sqrt{\frac{4 - x^2}{[x] + 2}}$ where [x] denotes the greatest interger not more than x, is

A. $(-\infty, -2) \cup (1, 2)$

B. $(-\infty, -2) \cup (-1, 2)$

C. $(-\infty, -2), \cup [-1, 2]$

D. $(-\infty, -1) \cup (1, 2)$

Answer: C

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161. if $a_n = \sqrt{7 + \sqrt{7 + \sqrt{7 + n....}}}$ times, then which one of the following is true ?

A. $a_n > 7, \forall n \geq 1$

B. $a_n > 3, \forall n \geq 1$

C. $a_n < 4, \forall n \leq 1$

D. $a_n < 3, \forall n \leq 1$

Answer: C

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162. If A is square matrix of order 2 and $A^2 + A + 2I = 0$ then

A. A can not be a skew-symmetric matrix

B. $|A + l| = 0$

C. A is one singular and $A^{-1} = (A + l)^{-1}$

D. $|A||A + l| = 2$

Answer: A

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163. If A is square matrix of order 3, then consider the following statements

I. If |A|=0 , then |AdjA|=0

II. If $|A| \neq 0$, then $\left|A^{-1}\right| = |A|^{-1}$

Which of the above statements is / are ture ?

A. Both I and II

B. Neither I nor ||

C. I only

D. II only

Answer: A

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164. The system of equations x-2y+3z=5, 2x-2y+z=0, -x+2y-3z=6 has

A. infinitely many solutions

B. exactly tow solutions

C. unique solution

D. no solution

Answer: D

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165. The amplitude of $\sin\frac{\pi}{5}+I\left(1-\cos\frac{\pi}{5}\right)$ is

A. $\frac{\pi}{15}$

B. $\frac{\pi}{10}$

C. $\frac{\pi}{5}$

D. $\frac{2\pi}{5}$

Answer: B

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166. If a point p dentes a complex number z=x+iy in the argand plane and if $\frac{z+1}{z+i}$ is a purely real number , then the locus of p is

A. $x+y+1=0$

B. $x^2+y^2+x+y=0$

C. $x^2+y^2+2Y+1=0, (x, y) \neq (0, -1)$

D. $x+y+1=0, (x, y) \neq (0, -1)$

Answer: D

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167. If ω is complex cube root of unity , the $\left[\frac{51+73\omega+87\omega^2}{73+87\omega+51\omega^2}+\frac{51+73\omega+87\omega^2}{87+51\omega+73\omega^2}\right]^{15}=$

A. 1

B. -1

C. 0

D. 2

Answer: B

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168. If $z \in C$ and $iz^3 + 4z^2 - z + 4i = 0$, then a complex root of this euquation having minimum magnitude is

A. $4i$

B. $\frac{1-i}{\sqrt{2}}$

C. $\frac{\sqrt{3}+I}{2}$

D. $\frac{1+i}{\sqrt{2}}$

Answer: B

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169. If α and β are the roots of the equation $x^2 - 4x + 5 = 0$ then thequadratic equation whose roots are $\alpha^2 + \beta \text{and} \alpha + \beta^2$ is

A. $x^2 + 10x + 34 = 0$

B. $x^2 - 10x + 34 = 0$

C. $x^2 - 10x - 34 = 0$

D. $x^2 = 10x - 34 = 0$

Answer: B

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170. f(x) is quadratic expression such that f(x) is negative when $x \in \left(-\infty, -\frac{5}{3}\right) \cup (3, \infty)$ and positive when $x \in \left(-\frac{5}{3}, 3\right)$ g(x) is another quadratic expression sunc that g (x) is negative when $x \in \left(3, \frac{9}{4}\right)$ and positive when $x \in R - \left[3, \frac{9}{2}\right]$ Then, the sign of $f(x)g(x)$ is [0,5] is

A. positive in $\left[0, \frac{9}{2}\right]$ and negative in $\left(\frac{9}{2}, 5\right)$

B. positive in $[0, 3] \cup \left(3, \frac{9}{2}\right)$ and negative in $\left(\frac{9}{2}, 5\right]$

C. positive in $[0, 3) \cup \left(3, \frac{9}{2}\right)$ and negative in $\left(\frac{9}{5}, 5\right]$

D. positive in $(0, 3) \cup \left(3, \frac{9}{2}\right) \cup \left(\frac{9}{2}, 5\right]$

Answer: B

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171. If a, b c $\in$ R are such that $4a + 2b + c > 0$ and $ax^2 + bx + c = 0$ has no real roots, then the value of (c+a)(c+b) is

A. greater than ab

B. less than bc

C. greater than ca

D. less than ab + bc + ca

Answer: A

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172. The minimum degree of polynomial equation with rational coefficients having $\sqrt{3}+\sqrt{27}, \sqrt{2}+5i$ as two of its roots is

A. 8

B. 6

C. 4

D. 2

Answer: B

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173. If all the digits in the number 53426 are permuted in all possible ways and are arranged in decreasing order, then the number having rank 89,is

A. 34265

B. 34256

C. 43526

D. 43265

Answer: A

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174. Three parallel straight lines L_i, L_2 and L_3 lie on the same plane. Consider 5 points on L_i7 points on L_2 and 9 pionts on L_3 . Then the maximum possible number of triangles formed with vertices these points, is

A. 1330

B. 1200

C. 1201

D. 129

Answer: C

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175. If $a > 0$ and the coefficient of x^2 in the expansion of $\left(ax^3 + \frac{c}{x}\right)^6$ is 60, then $ac^2 =$

A. 2

B. 3

C. 4

D. 5

Answer: A

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176. If $x = \frac{3}{4.8} + \frac{3.5}{4.8.12} + \frac{3.5.7}{4.812.16} + \ldots$, then $2x^2 + 5x =$

A. $\frac{7}{8}$

B. 7

C. $\frac{7}{16}$

D. $\frac{7}{4}$

Answer: A

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177. If $\frac{3x^2+1}{(x^2+1)(x^2+2)^2}=\frac{Ax+B}{x^2+1}+\frac{Cx+D}{x^2+2}+\frac{Ex+F}{(x^2+2)^2}$, then A +C +E=

A. 0

B. $\frac{7}{3}$

C. 1

D. $\frac{4}{3}$

Answer: A

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178. If $\tan\left(\frac{\pi}{4}+\frac{y}{2}\right)=\tan^3\left(\frac{\pi}{4}+\frac{x}{2}\right)$ then $\frac{3\sin x+\sin^3 x}{1+3\sin^2 x}=$

A. 0

B. 1

C. sin2y

D. sin Y

Answer: D

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179.

$(\cos 252^\circ - \sin 126^\circ)(\cos 252^\circ + \sin 126^\circ)\left(\sin^2 126^\circ + \sin^2 186^\circ + \sin^2 66\right.$

A. $\frac{3\sqrt{5}}{8}$

B. $\frac{-3\sqrt{5}}{8}$

C. $\frac{-3\left(\sqrt{5}\right)}{4}$

D. $3\frac{\sqrt{5}}{4}$

Answer: B

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180. If α, β, γ are any three angles , then $\cos\alpha + \cos\beta - \cos\gamma - \cos(\alpha + \beta + \gamma) =$

A. $4\frac{\cos(\alpha+\beta)}{2}\frac{\cos(\beta+\gamma)}{2}\frac{\cos(\gamma+\alpha)}{2}$

B. $4\frac{\cos(\alpha+\beta)}{2}\frac{\sin(\beta+\gamma)}{2}\frac{\sin(\gamma+\alpha)}{2}$

C. $4\frac{\cos(\alpha+\beta)}{2}\frac{\sin(\beta-\gamma)}{2}\frac{\sin(\gamma-\alpha)}{2}$

D. $4\frac{\sin(\alpha+\beta)}{2}\frac{\cos(\gamma+\alpha)}{2}$

Answer: B

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181. The general solution of the equation $\sqrt{3-5\sin x+\sin^2 x}$ + cos x =0 is

A. $n\pi+(-1)^n\frac{\pi}{6,}n\in z$

B. $2n\pi\pm\frac{\pi}{6}, n\in z$

C. $(2n+1)\pi-\frac{\pi}{6,}n\in Z$

D. $2n\pi\pm\left(5\frac{\pi}{6}\right), n\in Z$

Answer: C

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182. Consider the following statements.

I. $\sin^{-1}\left(y^2-4y+6\right)+\cos^{-1}\left(y^2-4y+6\right)=\frac{\pi}{2}, \forall y\in R$

II. $\sec^{-1}\left(y^2-4y+6\right)+\cos ec^{-1}\left(y^2-4y+6\right)=\frac{\pi}{2}, \forall y\in R$

Which of the above statements (s) is / are true ?

A. Only I

B. Only II

C. Both I and II

D. Neither I nor II

Answer: B

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183. If $\sec\theta$ cos h y= cosec x and cosec θ sinh y = sec x, then $\sinh^2 y =$

A. $\cos^2 x$

B. $\cos x$

C. $\sin^2 x$

D. $\sin x$

Answer: A

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184. Consider the following statements.

I. In ΔABC , if c=6 and cos $C = \frac{-11}{25}$ then, $R = \frac{25}{2\sqrt{14}}$

II. In ΔABC if a = 3 , b= 4 , c=6 , then ABC is acute angled triangle

Which of the above statements is / are true ?

A. Only I

B. Only II

C. Both I and II

D. Neither I nor II

Answer: A

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185. In ΔABC , if a=3 , b=4,c=6 then $\frac{\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}}{\cot A + \cot B + \cot C} =$

A. $\frac{13}{61}$

B. $\frac{169}{61}$

C. $\frac{61}{169}$

D. $\frac{61}{13}$

Answer: B

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186. If the reciprocals of the lengths of the sides of a ΔABC are in harmonic progression, then its ex-radii $r_1 r_2, r_3$ are in

A. Arithmetic progression

B. Geometric progression

C. Harmonic progression

D. Arithmetico-geometric progression

Answer: C

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187. If p and Q are two points on the curve $y = 2^{x+2}$ such that OP $. \hat{i} = -1$ and QQ $\hat{i} = 2$ then the magnitude of $(OQ - 4OP)$ is

A. 10

B. 1

C. 5

D. 100

Answer: A

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188. P and Q are points on the straight line passing to the vector $2\hat{i} - \hat{j} - \hat{k}$ and parallel to the vector $2\hat{i} - \hat{j} + 2\hat{k}$, If $AP = AQ = 3$, then the vector equation of the plane OPQ is

A. $r = (s + 5t)\hat{i} + 2s\hat{j} + (t - 3s)\hat{k}$

B. $r = \left(3\hat{i} + \hat{j} - \hat{k}\right) + s\left(2\hat{i} - \hat{j} + 2\hat{k}\right) + t\left(5\hat{i} + \hat{k}\right)$

C. $r = (s + 5t)\hat{i} + 2s\hat{j} + (5s + t)\hat{k}$

D. $r = (3t - s)\hat{i} + 2s\hat{j} + (t - 3s)\hat{k}$

Answer: A

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189. Let m be the unit vector orthogonal to the vector $\hat{i} - \hat{j} + \hat{k}$ and coplanar with the vectors $2\hat{i} + \hat{j} AND \hat{j} - \hat{\hat{k}}$, If $a = \hat{i} - \hat{k}$, then the length of the perpendicular from the origin to the plane r.m=a.m is

A. $\dfrac{1}{\sqrt{26}}$

B. $\dfrac{1}{\sqrt{5}}$

C. $\dfrac{5}{\sqrt{26}}$

D. 1

Answer: C

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190. If a,b,c are non- coplaner unit vectors such that $a \times (b \times c) = \frac{b + c}{\sqrt{2}}$, then the angle between a and b is

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

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

C. C $\frac{\pi}{2}$

D. D $\frac{3\pi}{4}$

Answer: D

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191. If a and b are two unit vectors such that $c = (a \times c) + b$ then the maximum value of [a bc] is

A. 1

B. $\frac{1}{2}$

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

D. 2

Answer: B

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192. If α, β, γ are non-zero vectors such that $|\beta| = |\gamma| = 1$ and $|\alpha|$= 10, then

A. 10

B. 1

C. 0

D. 12

Answer: C

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193. The arithmetich mean and standard deviation of a data of nine numbers are 13 and 5 respectively. If 3 is incoluded as the 10th item of the data, then the variance of the data of ten number is

A. 23.5

B. 21.5

C. 31.5

D. 27

Answer: C

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194. The variance of the following distribution is

Marks	1-3	3-5	5-7	7-9
Number of students	40	30	20	10

A. 2

B. 4

C. 6

D. 8

Answer: B

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195. A and B are two events such that P(A)=0.58 P(B) =0.32 and $P(A \cap B) = 0.28$ .Then the probability that neither A nor B occurs is

A. 0.38

B. 0.62

C. 0.72

D. 0.9

Answer: A

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196. Two dice are thrown simultaneosly. If A is event of getting the sum of the numbers on two dice as greater thatn or equal to 8 and B is the event of getting a number lessw than of equal to 3 on atleast one of the die. Then P(B/A)=

A. $\frac{5}{15}$

B. $\frac{6}{15}$

C. $\frac{7}{15}$

D. $\frac{8}{15}$

Answer: B

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197. A bag contains 6 balls .if 4 are drawn at a time and all of then are found to be red, then probability that exactly 5 of the balls in the bag are red is

A. $\frac{10}{19}$

B. $\frac{5}{21}$

C. $\frac{1}{21}$

D. $\frac{5}{7}$

Answer: B

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198. If the probability distribution of a random variable X is given by

$X = x_i$	0	1	2	3
$P(X = x_i)$	$\frac{1}{8}$	$\frac{3}{8}$	$3K$	K

A. 3

B. $\frac{9}{4}$

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

D. $\frac{3}{4}$

Answer: D

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199. A manufacturer of locks knows that 2 % of his product is defective . If he sells the locks in boxes each with 100 locks and gurantees that not more than 2 locks will be defectiave in a box, then the probability that a box will fail to meet the guranteed quality is

A. $1 - 5e^{-2}$

B. $\sum_{k=2}^{100} {}^{100}C_k \left(\frac{1}{50}\right)^k \left(\frac{49}{50}\right)^{100-k}$

C. 0.02

D. $1 - 3e^{-2}$

Answer: A

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200. The equation of the locus of point $(2\cos\theta - 3, 3\sin\theta - 4)$ is

A. $9x^2 + 4y^2 + 54x + 32y + 181 = 0$

B. $4x^2 + 2y^2 - 1 = 0$

C. $9x^2 + 4y^2 + 54x + 32y + 109 = 0$

D. $9x^2 + 4y^2 + 54x + 32y + 109 = 0$

Answer: D

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201. When the origin is shifted to the point (2,3) and then the coordinate axes are rotated through and angle $\frac{\pi}{3}$ in the counter clockwise sense, then the transformed equation of $3x^2 + 2xy + 3y^2 - 18x - 22y + 50 = 0$ is

A. $3x^2 + 3y^2 - 1 = 0$

B. $(6 + \sqrt{3})x^2 - 2xy + (6 - \sqrt{3})y^2 - 2 = 0$

C. $4x^2 + 2y^2 - 1 = 0$

D. $(6 - \sqrt{3})x^2 + (6 + \sqrt{3})y^2 + 2xy = 0$

Answer: B

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202. A strainght line L with negative slope passes through the point (1,1) and cuts the positve coordinates axes at the points A and B . If O is the origin , thene the minimum value of $OA + OB$as L varies , is

A. 1

B. 2

C. 3

D. 4

Answer: D

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203. If the straight line $L = 3x + 4y - k = 0$ cuts the line segment joining the points P(2,-1) and Q(1,1) in the ratio 4:1 , then the equation of the line parallel to the line y=x and concurrent with the lines PQ and L =0 is

A. $2x - 2y + 7 = 0$

B. $x - y + 1 = 0$

C. $5x - 5y - 3 = 0$

D. $y = x + 3$

Answer: C

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204. The orhtcentre and the centroid of ΔABC are $(5, 8)$ and $\left(3, \frac{14}{3}\right)$ respectively. The equation of the side BC is x-y=0 , Given that the image of the orthocentre of a triangle with respect to any side lies on the circumcircle of that triangle, then the diameter of the circumcircle of ΔABC is

A. $\sqrt{10}$

B. $2\sqrt{10}$

C. $4\sqrt{10}$

D. $8\sqrt{10}$

Answer: C

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205. If a pair of perpendicular lines through the origin together with the straight line $2x+3y=6$ from an isosceles triangle, thene the area of that triangle (in sq units) is

A. $\frac{6}{\sqrt{13}}$

B. $\frac{6}{13}$

C. $\frac{36}{13}$

D. $\frac{27}{13}$

Answer: C

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206. If the equation $3x^2 + 7xy + 2y^2 + 2gx + 2fy + 2 = 0$ represents a pair of intersecting lines and the square of the distance of their point of intersection from the origin is $\frac{2}{5}$, then $f^2 + g^2$=

A. $\frac{25}{4}$

B. 25

C. 50

D. $\frac{25}{2}$

Answer: D

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207. Tangents are drawn to $x^2 + y^2 = 16$ from the point P(0,h) These tangents meet the x- axis at A and B . If the area of triangle P AB is minimum , then

A. $x^2 + y^2 = 6\sqrt{2}$

B. $x^2 + y^2 = 64$

C. $x^2 + y^2 = 32$

D. $x^2 + y^2 = 4\sqrt{2}$

Answer: C

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208. If the angle between the tangents drawn to the circle $x^2 + y^2 - 12x - 16y = 0$ at the points where the line $5y = 5x = k$ cut the circle is 60° , then the value of k is

A. $5 + \sqrt{2}$

B. $5(2 \pm 5\sqrt{2})$

C. $2 \pm 5\sqrt{2}$

D. $5 \pm \sqrt{2}$

Answer: B

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209. If a circle S with radius 5 touches the circle $x^2 + y^2 - 6x - 4y - 12 = 0$ at (-1,-1) , then the length of the tangent from the centre of the circle S to the given circle is

A. $5\sqrt{3}$

B. $\sqrt{65}$

C. 10

D. $3\sqrt{11}$

Answer: A

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210. If a circle S passing throught the point (3,4) cuts the circle $x^2 + y^2 = 36$orthogonally then locus of the centre of S is

A. $x^2 + Y^2 - 6x - 8y + 11 = 0$

B. $6x + 8y - 61 = 0$

C. $x^2 + y^2 - 8x - 6y + 11 = 0$

D. $6x + 8y + 11 = 0$

Answer: B

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211. The line x-2=0 cuts the circle $x^2 + y^2 - 8x - 2y + 8 = 0$ at A and B . The equation of the circle passing through the points A and B and having least radius is

A. $x^2 + y^2 - 4x + 2y - 1 = 0$

B. $x^2 + y^2 - 4x - 2y = 0$

C. $x^2 + y^2 - 4x - 2y + 1 = 0$

D. $x^2 + y^2 - 4x + 4y = 0$

Answer: B

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212. If a perpendicular drawn through the vertex O of the parabola $y^2 = 4ax$ to any of its tangent meets the tangent at N and the parabola at M, then ON.OM=

A. $4a^2$

B. $3a^2$

C. $2a^2$

D. a^2

Answer: A

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213. Let α_1 and α_2 be the ordinates of two points A and B on a parabola $y^2 = 4ax$ and let α_3 be the ordinate of the point of intersection of its tangents at A and B. Then $\alpha_3 - \alpha_2 =$

A. $\alpha_3 - \alpha_1$

B. $\alpha_3 + \alpha_2 =$

C. α_1

D. $\alpha_1 - \alpha_3$

Answer: D

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214. Equations of the latus recta of the ellipse $9x^2 + 4y^2 - 18x - 8y - 23 = 0$ are

A. $x = -1 \pm \sqrt{5}$

B. $y = 1 \pm \sqrt{5}$

C. $x = 1 \pm \frac{2\sqrt{5}}{3}$

D. $y = 2 \pm \sqrt{5}$

Answer: B

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215. The equation of the tangent of the ellipse $4x^2 + 9y^2 = 36$at the end of the latusrectum lying in the second quadrant, is

A. $\sqrt{5}x - 3y + 1 = 0$

B. $x - 3y + \sqrt{5} = 0$

C. $\sqrt{5}x - 3y + 3 = 0$

D. $\sqrt{5}x - 3y + 9 = 0$

Answer: A

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216. If the product of the lengths of the perpendiculars from any point on the hyperbola $16x^2 - 25y^2 = 400$ to its asymptotes is ρ and the angle between the two asymptotes is θ then $\rho \quad \tan \quad \frac{\theta}{2}$ =

A. $\frac{400}{41}$

B. $\frac{320}{41}$

C. $\frac{4}{5}$

D. $\frac{25}{16}$

Answer: B

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217. A(3,2,-1),B(4,1,1,)C(6,2,5) and D(3,3,3) are four points $G_1G_2G_3$ and G_4 respectively are the centroids of the triangle

$\Delta BCD, \Delta CDA, \Delta DAB, \Delta ABC$. The point of concurrence of the lines $AG_1, BG_2, CG_3, \text{ and } DG_4$ is

A. (4,2,2)

B. (2,4,2)

C. (2,2,4)

D. (2,2,2)

Answer: A

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218. If the directin cosines of two lines satisfy the equation $l + m + n = 0 \text{ and } 2lm + 2\ln - mn = 0,$ then the acute angle between those two lines is

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

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

C. $\frac{\pi}{3}$

D. $\frac{2\pi}{5}$

Answer: C

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219. A variable plane passes through a fixed point (α, β, γ) and meets the coordinate axes in A,B, and C. let P_1P_2 and P_3 be the planes passing through A,B,C and parallel to the coordinate planes YZ,ZX,XY respectively . Then, the locus of the points of intersection of the planes P_1P_2 and P_3 is

A. $\alpha x + \beta y + \gamma z = 1$

B. $\frac{\alpha}{x}, \frac{\beta}{y} + \frac{\gamma}{z} = 1$

C. $a x_2 + \beta y^2 + \gamma z^2 = 1$

D. $\alpha\beta x + \beta\gamma y + \alpha\gamma z = 1$

Answer: B

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220. $\lim_{x \to \frac{\pi}{2}} \frac{1 + \cos 2x}{\cot 3x \left(3^{\sin 2x} - 1\right)} =$

A. $\frac{1}{3 \log 9}$

B. $\frac{2}{3 \log 3}$

C. $\frac{1}{3 \log 3}$

D. $\frac{3}{\log 3}$

Answer: C

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221. $\lim_{n \to \infty} n^{-nk}$

$$\left\{ (n_+ 1) \left(n + \frac{1}{2}\right) \left(n + \frac{1}{2}\right) \dots \left(n + \frac{1}{2^{k-1}}\right) \right\}^n =$$

A. 2

B. $e^{2\left(1 - \frac{1}{2^k}\right)}$

C. $\left(1-\frac{1}{2^k}\right)$

D. e^2

Answer: B

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222. If a and b$(a>b)$ are points of discontinuity of the function

$$f(x)=\begin{cases}3-2x^2 & \text{for} \quad x\le 0\\ 2x+3 & \text{for} \quad 0<x\le 1\\ 2x^2-3x & \text{for} \quad 1<x<2\\ 2x-3 & \text{for} \quad 2\le x<3\\ |x| & \text{for} \quad \ge 3\end{cases}$$

then 3a-b =

A. 3

B. 7

C. 5

D. 1

Answer: C

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223. For $-1 < x < 1,$ if $f(x) = \cos^2\left(\tan^{-1}\sqrt{\frac{1-x}{1+x}}\right)$ then f'(x)=

A. $\frac{1}{2}$

B. 1

C. -1

D. $\frac{-1}{2}$

Answer: A

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224. $f: R \to R$ is a function such that f(0)=1 and for all $x, y \in R f(xy+1) = f(xy+1) = f(x)f(y) - f(y) - x + 2$ then $\frac{df}{dx}$ at x=e is

A. 0

B. -1

C. e

D. 1

Answer: D

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225. $y = \sin(\log(x^2 + 2x + 1))$

$$\Rightarrow (x+1)^2 \frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} =$$

A. y

B. $-4y$

C. $4y$

D. $-y$

Answer: B

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226. The angle between the curves $y^2 = 4x$ and $x^2 = 4y$ is

A. $\tan^{-1}\left(\frac{1}{2}\right)$

B. $\sin^{-1}\left(\frac{3}{5}\right)$

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

D. $\tan^{-1}\left(\frac{2}{3}\right)$

Answer: B

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227. If $x > 0$, then $\frac{x}{1+x} - \log(1+x)$

A. is less than zero

B. is greater than zero

C. is equal to zero

D. takes all the real values

Answer: A

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228. On the curve $y = x^3$, the point at which the tangent line is parallel to the chrod joinnig the points $(\,-1,\ -1)$ and (2,8) is

A. $(1-1)$

B. $(2, 8)$

C. $(1, 1)$

D. $(3, 27)$

Answer: C

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229. If the petrol burnt in driving a motor boat varies as the cube of the velocity , then the speed (in km/hour) of the boat going against a water floe of C kms/hour so that the quantity of petro burnt is minimum is

A. $\frac{2C}{3}$

B. $\frac{3C}{2}$

C. $\frac{4C}{3}$

D. $\frac{3C}{4}$

Answer: B

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230. For $x < 1$, $\int \frac{x - x^2}{\sqrt{1-x}} dx =$

A. $\frac{4}{3}(1-x)^{3/2} - \frac{2}{5}(1-x)^{5/2} - 2\sqrt{1-x} + C$

B. $\frac{4}{3}(1-x)^{3/2} - \frac{2}{3}(1-x)^{5/2} - 2\sqrt{1-x} + C$

C. $\frac{2}{3}(1-x)^{3/2} - \frac{2}{3}(1-x)^{5/2} - 2\sqrt{1-x} + C$

D. $-\frac{2}{15}(1-x)^{3/2}(2+3x) + C$

Answer: D

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231. If $\int \frac{dx}{(2\sin x+\sec x)^4}=At^5+Bt^6+Ct^7+k,$ wher $t=(1+\tan x)^{-1}$, then $A+B+C$=

A. $\frac{-86}{105}$

B. $\frac{-1}{105}$

C. $\frac{-26}{105}$

D. $\frac{-16}{105}$

Answer: D

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232. $\int \frac{2x^2-1+x^2\sqrt{x^2+4}}{x^2(x^2+4)}dx$

A. $\frac{9}{8}\frac{\tan^{-1}x}{2}+\frac{1}{4x}+\frac{\cos h^{-1}x}{2}+C$

B. $\frac{9}{8}\tan^{-1}\frac{x}{2}+\frac{1}{4x}+\sinh^{-1}\frac{x}{2}+c$

C. $\frac{9}{16}\log\left|\frac{x+2}{x-2}\right|+\frac{1}{4x}+\log\left|\frac{x+\sqrt{x^2+4}}{2}\right|+C$

D. $\frac{-9}{16}\log\left|\frac{2-x}{2+x}\right|+\frac{1}{4x}+\cosh^{-1}\frac{x}{2}+C$

Answer: B

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233. For $n \geq 2$, let $I_n = \int_0^{\pi/4} \tan^n x dx$ and $F_n = I_n + I_{n-2}$. Then $F_n - F_{n+1} =$

A. $\frac{1}{n}$

B. $\frac{1}{n-1}$

C. $\frac{1}{n(n-1)}$

D. $1+n$

Answer: C

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234. $\lim_{n \to \infty} n\left[\frac{1}{(3n^2 + 8n + 4)} + \frac{1}{3n^2 + 16n + 16} + \dots. + \frac{1}{15n^2}\right] =$

A. $\frac{1}{2}\log\frac{9}{5}$

B. $\frac{1}{4}\log\frac{9}{5}$

C. $2\log\frac{9}{5}$

D. $\frac{1}{4}\log\frac{5}{9}$

Answer: B

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235. $\int_0^3 |x^2 - 3x + 2| dx$

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

B. $\frac{1}{6}$

C. $\frac{11}{6}$

D. $\frac{11}{2}$

Answer: C

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236. OABC is a unit square where O is origin and B = (1,1) . The curves $y^2 = x$ and $x^2 = y$ divide the are of the square into three three parts OABO,OBO and OBCO, if a_1, a_2, a_3 are the areas (in sq units) of these parts respectively, then $a_1 + 2a_2 + 3a_3 =$

A. 1

B. 2

C. 6

D. 64

Answer: C

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237. The differential equation correspoinding to the family of parabola $y^2 = 4a(x+a)$ where a is the parameter , is

A. $y\left(\frac{dy}{dx}\right)^2 + 2x\frac{dy}{dx} + y = 0$

B. $y\left(\frac{dy}{dx}\right)^2 - 2x\frac{dy}{dx} - y = 0$

C. $y\left(\frac{dy}{dx}\right)^2 + 2x\left(\frac{dy}{dx}\right) - y = 0$

D. $y = 2x\frac{dy}{dx}$

Answer: C

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238. The general solution of $\frac{dy}{dx} + y\tan x = 2x + x^2$ tan x

A. $y - x^2 = c\sec x$

B. $y\cos x = x^2\sec x + c$

C. $y \sec x = x^2 + c\cos x$

D. $y = x^2 + c\cos x$

Answer: D

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239. If $g(x) = x^2 + x - 2$ and $\frac{1}{2} gof(x) = 2x^2 - 5x + 2$, then which is $f(x)$

A. 2x - 3

B. 2x + 3

C. 2 + 2x

D. $2x^2 - 3x - 1$

Answer: A

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240. If $f: R \to A$ defined by $f(x) = \frac{1}{x^2 + 2x + 2}, \forall x \in R$ is surjective, then A =

A. $[1, \infty]$

B. $(1, \infty)$

C. [0, 1]

D. (0, 1]

Answer: D

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241. If $2(4^{2n+1}) + 3^{3n+1}$ is divisible by k, $k > 1$ for all $n \in N$, then the value of k is

A. 19

B. 17

C. 11

D. 13

Answer: C

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242. If $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then the incorrect option among the following is

A. $A^3 - I = A(A - I)$

B. $(A^3 + I) = A(A^3 - I)$

C. $A^4 - I = A^2 + I$

D. $A^2 + I = A(A^2 - I)$

Answer: D

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243. If $a \neq 1, b \neq -1, c \neq -1$ and the system of equations, $x = a(y+z), y = b(z+x), z = c(x+y)$ has a non-trivial solution, then.

A. $\frac{a}{a+1} + \frac{b}{b+1} + \frac{c}{c+1} = 0$

B. $\frac{a}{a+1} + \frac{b}{b+1} + \frac{c}{c+1} = 1$

C. $\frac{abc}{(a+1)(b+1)(c+1)} = 1$

D. $\frac{a+b+c}{(a+1)(b+1)(c+1)} = 2$

Answer: B

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244. The rank of the following matrix A is

$$A = \begin{bmatrix} 1 & -2 & 3 & -4 \\ 2 & 9 & 4 & 5 \\ 4 & 5 & 10 & -3 \\ 1 & 11 & -1 & 9 \end{bmatrix}$$

A. 4

B. 3

C. 2

D. 1

Answer: B

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245. If a complex number z satisfies $|z|^2 + 1 = |z^2 - 1|$, then the locus of z is

A. a circle

B. the real axis

C. the imaginary axis

D. the straight line y = x

Answer: C

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246. If $\frac{z-i}{z+1}$ is purely imaginary then the locus of z = x + iy is

A. the circle with centre $\left(\frac{1}{2}, \frac{1}{2}\right)$ and radius $\frac{1}{\sqrt{2}}$

B. the circle with centre $\left(-\frac{1}{2}, -\frac{1}{2}\right)$ and radius $\frac{1}{\sqrt{2}}$

C. the point on the circle with centre $\left(\frac{1}{2}, \frac{1}{2}\right)$ and radius $\frac{1}{\sqrt{2}}$, excluding the point (1, 0) and (0, 1)

D. the points on the circle with centre $\left(-\frac{1}{2}, -\frac{1}{2}\right)$ and radius $\frac{1}{\sqrt{2}}$, excluding the origin

Answer: C

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247. If a, b, c are non-zero real number with $c \neq 1$ such that $a^2+b^2+c^2=c$ and if $\alpha=\frac{a+ib}{1-c}$, then a^2+b^2 =

A. $\frac{|\alpha|^2}{\left(1+|\alpha|^2\right)^2}$

B. $\dfrac{|\alpha|^4}{\left(1+|\alpha|^2\right)^2}$

C. $\dfrac{|\alpha|}{1+|\alpha|^2}$

D. $\dfrac{|\alpha|}{1+|\alpha|}$

Answer: A

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248. For $n \in Z^+$,

$(1+\sin\theta+i\cos\theta)^n+(1+\sin\theta-i\cos\theta)^n=$

A. $2^{n+1}\cdot\cos^n\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\cos\left(\frac{n\pi}{4}-\frac{\theta}{2}\right)$

B. $2^{n+1}\cdot\cos^n\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\sin\left(\frac{n\pi}{4}-\frac{\theta}{2}\right)$

C. $2^{n+1}\cdot\cos^n\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\cos\left(\frac{n\pi}{4}-\frac{n\theta}{2}\right)$

D. $2^{n+1}\cdot\cos^n\left(\frac{\pi}{4}-\frac{\theta}{2}\right)\sin\left(\frac{n\pi}{4}-\frac{n\theta}{2}\right)$

Answer: C

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249. If the quadratic equation formed by eliminating x from $x^2 + \alpha x + \beta = 0$ and $xy + l(x + y) + m = 0$ has the same roots as that of the given quadratic equation, then the set of values of β is

A. $\{m, \alpha l - m\}$

B. $\{m, l + m\}$

C. $\{m, \alpha l + m\}$

D. $\{m, l - m\}$

Answer: A

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250. If x is real, then the range of $\frac{x^2 + 2x + 1}{x^2 + 2x + 7}$ is

A. [0, 1)

B. $(- \infty, 0) \cup (1, \infty)$

C. (0, 1)

D. R

Answer: A

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251. If [x] denotes the greatest integer not exceeding x, then the values of x satisfying

$[x]^2 - 7[x] + 12 \leq 0$ are

A. $1 \leq x < 4$

B. $3 \leq x < 5$

C. $-5 < x \leq -3$

D. $2 \leq x \leq 4$

Answer: B

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252. If the equation whose roots are p times the roots of $x^4 - 2ax^3 + 4bx^2 + 8ax + 16 = 0$ is a reciprocal equation, then |p| =

A. 3

B. 2

C. $\frac{1}{2}$

D. $\frac{1}{3}$

Answer: C

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253. The number of three digit numbers in which 9 appears only in one place is

A. 243

B. 234

C. 217

D. 225

Answer: D

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254. $^{34}C_{10} + 3 \cdot \left(^{34}C_9\right) + 3 \cdot \left(^{34}C_8\right) + ^{34}C_7 =$

A. $^{38}C_{10}$

B. $^{36}C_{10}$

C. $^{37}C_{10}$

D. $^{35}C_{10}$

Answer: C

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255. The coefficient of x^{50} in the expansion of $(1+x)^{100}+2x(1+x)^{99}+3x^{2}(1+x)^{98}+\ldots+101x^{100}$, is

A. ${}^{100}C_{50}$

B. ${}^{101}C_{50}$

C. ${}^{102}C_{50}$

D. ${}^{103}C_{50}$

Answer: C

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256. If $\alpha=\frac{5}{2!\times 3}+\frac{5\times 7}{3!\times 3^{2}}+\frac{5\times 7\times 9}{4!\times 3^{3}}+\ldots,$ then $\alpha^{2}+4\alpha=$

A. 21

B. 23

C. 25

D. 27

Answer: B

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257. If $\frac{x^4+24x^2+28}{(x^2+1)^3} = \frac{A}{(x^2+1)} + \frac{B}{(x^2+1)^2} + \frac{C}{(x^2+1)^3}$, then A + C =

A. 12

B. 10

C. 9

D. 6

Answer: D

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258. If $\tan\theta = \dfrac{\cos 25^\circ + \sin 25^\circ}{\cos 25^\circ - \sin 25^\circ}$ and θ is in the third quadrant, then θ =

A. 200°

B. 205°

C. 225°

D. 250°

Answer: D

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259. If

$\cos A = \dfrac{7}{25}$ and $\dfrac{3\pi}{2} < A < 2\pi$, then $\cos\dfrac{A}{4} + \cos\dfrac{A}{2} - \cos 2A =$

A. $\dfrac{1}{\sqrt{10}} + \dfrac{27}{625}$

B. $\dfrac{3}{\sqrt{10}} - \dfrac{27}{625}$

C. $\dfrac{3}{\sqrt{10}} + \dfrac{27}{625}$

D. $\frac{1}{\sqrt{10}} - \frac{27}{625}$

Answer: A

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260. In ΔABC, if $\cos 3A + \cos 3B + \cos 3C + \cos 3\pi = 0$, then the least value of the sum of two of its angles is

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

B. $\frac{2\pi}{3}$

C. $\frac{\pi}{3}$

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

Answer: C

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261. If θ in the interval $\left(0, \frac{\pi}{2}\right)$ satisfying the equation $\cos 2\theta \cdot \sec^4 \theta + \sec^2 \theta = 0$, then $\sin^2 \theta$ =

A. $\frac{1}{3}$

B. $\frac{3}{4}$

C. $\frac{1}{2}$

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

Answer: D

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262. $\lim_{n \to \infty} \sum_{r=1}^{n} \tan^{-1}\left(\frac{2r}{r^4 + r^2 + 2}\right) =$

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

B. $\frac{\pi}{2}$

C. $\frac{-\pi}{4}$

D. $\frac{-\pi}{2}$

Answer: A

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263. $\operatorname{sech}^2\left(\tanh^{-1}\frac{1}{2}\right)+\cos ech^2\left(\coth^{-1}3\right)=$

A. $\frac{35}{9}$

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

C. $\frac{25}{4}$

D. $\frac{35}{4}$

Answer: D

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264. In ΔABC, if $a\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=\frac{3b}{2}$ then a,b,c are in

A. 2b = a + c

B. $b^2 = ac$

C. $\frac{1}{b} = \frac{1}{a} + \frac{1}{c}$

D. a = c

Answer: A

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265. If s is the semi-perimeter of ΔABC and if

$$\frac{s-a}{4} = \frac{s-b}{5} = \frac{s-c}{6}, \text{ then } \sum \sin^2\left(\frac{A}{2}\right) =$$

A. $\frac{74}{25}$

B. $\frac{25}{74}$

C. $\frac{74}{33}$

D. $\frac{25}{33}$

Answer: D

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266. If I is incentre of the triangle ABC, P_1, P_2, P_3 are radii of circum circles of $\Delta^{\text{le}} IBC, ICA, IAB$ respectively

A. 2Rr

B. $2Rr^2$

C. $2R^2r$

D. $\frac{4R}{r}$

Answer: C

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267. If a and b are two unit vectors such that a + b is also a unit vector, then $|a-b|^2 =$

A. 1

B. 2

C. 3

D. 0

Answer: C

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268. If the line joining the points $\hat{i} + \hat{j}$ and $3\hat{i} + \hat{j} - \hat{k}$ meets the plane that passes through the point $2\hat{i} + 4\hat{j}$ and parallel to the vectors $3\hat{i} + 5\hat{k}$ and $3\hat{i} - \hat{k}$ at, P, then the position vector of the point P is

A. $-27\hat{i} + \hat{j} + 14\hat{k}$

B. $29\hat{i} + \hat{j} - 14\hat{k}$

C. $-14\hat{i} + 89\hat{j} + 3\hat{k}$

D. $2\hat{i} + 5\hat{j} - 7\hat{k}$

Answer: B

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269. If A, B, C and D are four points in the plane such that $|AB|^2 + |CD|^2 = |BC|^2 + |DA|^2 = 100$, then $AC \cdot BD$ =

A. 10

B. 0

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

D. 1

Answer: B

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270. If $a = \hat{i} + 2\hat{j} + 3\hat{k}, b = 2\hat{i} + 3\hat{j} + 2\hat{k},$ and c is a vector perpendicular to b, then

$$\left|\left\{\frac{a \cdot (b \times c)}{|b \times c|^2}\right\}(b \times c) + \left\{\frac{a \cdot b}{|b|^2}\right\}b + \left\{\frac{a \cdot c}{|c|^2}\right\}\right| =$$

A. $\sqrt{14}$

B. 14

C. 13

D. $\sqrt{17}$

Answer: A

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271. If a,b and c are three vectors such that |a|=1, |b|=2, |c|=3 and a.b=b.c=c.a=0, then |[a b c]| is equal to

A. 15

B. 14

C. 12

D. 8

Answer: A

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272. If $a = \hat{i} + \hat{j}, b = \hat{j} + \hat{k}, c = \hat{i} + \hat{k}$, then

$$\frac{[(b \times c) \times (c \times a)(c \times a) \times (a \times b)(a \times b) \times (b \times c)]}{[b + c \quad c + a \quad a + b][b \times c \quad c \times a \quad a \times b]}$$

A. 0

B. 1

C. $\sqrt{3}$

D. $\sqrt{2}$

Answer: B

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273. The standard deviation of the scores 505, 510, 515, 520, ..., 595 is

A. $500 + 5\sqrt{30}$

B. $505 + \sqrt{30}$

C. $5\sqrt{30}$

D. $5 + \sqrt{30}$

Answer: C

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274. If the variance of the distribution

x_i	4	8	11	17	20	24	32
f_i	3	5	9	5	4	3	1

is 45.8, then the variance of the distribution.

x_i	10	18	24	36	42	50	66
f_i	3	5	9	5	4	3	1

A. 93.6

B. $\sqrt{93.9}$

C. 183.2

D. $\sqrt{183.2}$

Answer: C

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275. A die is formed so that the probability of getting a number i when it is rolled is proportional to i. $(i = 1, 2, 3, 4, 5, 6)$. The probability of getting an odd number on the die when it is rolled is

A. $\frac{1}{2}$

B. $\frac{4}{7}$

C. $\frac{2}{7}$

D. $\frac{3}{7}$

Answer: D

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276. A problem is given to 3 students A, B and C whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. Then, the probability of the problem being solved by exactly one of them, if all the three try independently, is

A. $\frac{3}{4}$

B. $\frac{11}{24}$

C. $\frac{23}{24}$

D. $\frac{1}{4}$

Answer: B

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277. In a certain recruitment test with multiple choice questions, there are four options to answer each question, out of which only one is correct. An intelligent student knows 90% correct answers while a weak student known only 20% correct answers. If an intelligent student gets the correct answer for a question, then the probability that he was guessing it, is

A. $\frac{1}{37}$

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

C. $\frac{9}{37}$

D. $\frac{1}{2}$

Answer: A

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278. A random variable X has the following distribution

Values of X(x)	0	1	2	3	4	5	6	7
$P(X=x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$
Then $P(0<X<6)=$								

A. $\frac{9}{10}$

B. $\left(\frac{9}{10}\right)^2$

C. $\left(\frac{3}{10}\right)$

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

Answer: B

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279. An unbiased coin is tossed n times. If the probability of getting atleast one head is greater than 0.8, then the least value of n is

A. 2

B. 3

C. 4

D. 5

Answer: B

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280. If a point P moves such that the sum of the distance from P to the point A(1, -1) and B(-1, 1) is always 4, then the equation for the locus of P is

A. $16x^2 - 64x + 7y^2 = 48$

B. $3x^2 + 2xy + 3y^2 = 8$

C. 6x + 4y = 3

D. $x^2 + y^2 - 8x + 6y = 0$

Answer: B

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281. The transformed equation of $3x^2 - 6xy + 8y^2 = 8$ when the axes are rotated about the origin through an angle $\frac{\pi}{4}$ in the positive direction, is

A. $5x^2 + 10xy + 17y^2 + 16 = 0$

B. $5x^2 + 10xy + 17y^2 - 16 = 0$

C. $5x^2 - 10xy + 17y^2 - 16 = 0$

D. $5x^2 - 10xy + 17y^2 + 16 = 0$

Answer: B

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282. A variable line passing through a fixed point (α, β) intersects the coordinate axes at A and B. If O is the origin, then the locus of the centroid of the ΔOAB is

A. $\beta x + \alpha y - 2\alpha\beta = 0$

B. $\beta x + \alpha y - 3xy = 0$

C. $\alpha x + \beta y - (\alpha^2 + \beta^2) = 0$

D. $\beta x + \alpha y + 3xy = 0$

Answer: B

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283. If m = 1 is the slope of a line L, then the product of the slopes of non-parallel lines which are inclined at an angle of 60° with L is

A. 1

B. -1

C. $\sqrt{3}$

D. $-\frac{1}{2}$

Answer: A

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284. The area (in sq units) of the quardilateral formed by the lines 2x + 3y + 6 = 0, 2x - 3y + 6 = 0, 2x + 3y - 6 = 0 and 2x - 3y - 6 = 0 is

A. 12

B. 36

C. 6

D. 18

Answer: A

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285. If the staight lines 2x+3y-1=0,x+2y-1=0, and ax+by-1=0 from a triangle with the origin as orthocenter, then (a,b) is given by

A. (-8, 8)

B. (0, 7)

C. (6, 4)

D. (-3, 3)

Answer: A

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286. The product of the perpendicular distances from (1, -1) to the pair of lines $x^2 - 4xy + y^2 = 0$, is

A. 1

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

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

D. 2

Answer: C

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287. If a circle touches the lines 3x - 4y - 10 = 0 and 3x - 4y + 30 = 0 and its centre lies on the line x + 2y = 0, then the equation of the circle is

A. $x^2 + y^2 + 4x - 2y - 11 = 0$

B. $x^2 + y^2 + 2x - 4y - 11 = 0$

C. $x^2 + y^2 - 4x + 2y - 11 = 0$

D. $x^2 + y^2 + 2x - y - 11 = 0$

Answer: A

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288. The line 4x+4y-11=0 intersects the circle $x^2 + y^2 - 6x - 4y + 4 = 0$ at A and B. The point of intersection of the tangents at A,B is

A. $(-1, 2)$

B. $(-1, -2)$

C. (2, 1)

D. $(-2, -1)$

Answer: D

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289. The equation of the circle which passes through the point (3, 2) bisects the circumference of the circle $x^2 + y^2 = 15$ and cuts the circle $x^2 + y^2 + 4x + 6y + 3 = 0$ orthogonally is

A. $x^2 + y^2 + 6x + 8y - 43 = 0$

B. $x^2 + y^2 + 6x - 8y - 15 = 0$

C. $x^2 + y^2 - 6x + 8y - 11 = 0$

D. $x^2 + y^2 - 6x - 8y + 21 = 0$

Answer: B

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290. $x^2 + y^2 + 2x + 4y - 20 = 0$ and $x^2 + y^2 + 6x - 8y + 10 = 0$ are the given circles. Which one of the following is correct?

A. They intersect orthogonally and will have two common tangents. The length of their common chord is $\frac{5\sqrt{3}}{\sqrt{2}}$

B. They intersect at right angles and will have two common tangents. The length of their common chord is 2

C. They do not intersect orthogonally and will have three common tangents. The length of their direct common tangent is 5

D. They touch each other internally and will have only one common tangent

Answer: A

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291. Find the equation of the circle passing through the points of intersections of circles $x^2 + y^2 + 6x + 4y - 12 = 0, x^2 + y^2 - 4x - 6y - 12 = 0,$ and having radius $\sqrt{13}$.

A. $x^2 + y^2 + 6x + 8y + 12 = 0$

B. $x^2 + y^2 + 8x + 6y - 12 = 0$

C. $x^2 + y^2 + 6x + 8y - 12 = 0$

D. $x^2 + y^2 - 6x - 8y - 12 = 0$

Answer: C

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292. If a parabola passess through the points (-2, 1), (1, 2) and (-1, 3) having horizontal axis, then the length of the latus rectum of that parabola is

A. 5

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

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

D. $\frac{1}{5}$

Answer: C

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293. The equation of one of the common tangents of the circle $x^2 + y^2 - 6y + 4 = 0$ and the parabola $y^2 = x$ is

A. 2x - y + 1 = 0

B. 2x - y = 1

C. 4x - y + 1 = 0

D. x - 2y + 1 = 0

Answer: D

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294. The equation of the ellipse having a vertex at (6, 1), a focus at (4, 1) and the eccentricity $\frac{3}{5}$ is

A. $\frac{(x-1)^2}{16} + \frac{(y-1)^2}{25} = 1$

B. $\frac{(x-1)^2}{25} + \frac{(y-1)^2}{16} = 1$

C. $\frac{(x+1)^2}{25} + \frac{(y+1)^2}{16} = 1$

D. $\frac{(x+1)^2}{16}+\frac{(y+1)^2}{25}=1$

Answer: B

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295. If the tangent at the point $\left(4\cos 2\theta, \frac{16}{\sqrt{11}}\sin 2\theta\right)$ on the ellipse $16x^2+11y^2=256$ touches the circle $x^2+y^2-2x=15$, then θ =

A. $\pm\frac{\pi}{3}$

B. $\pm\frac{\pi}{6}$

C. $\pm\frac{\pi}{4}$

D. $\pm\frac{\pi}{8}$

Answer: B

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296. A tangent to the curve $9b^2x^2 - 4a^2y^2 = 36a^2b^2$ makes intercepts of unit length on each of the coordinate axes, then the point (a, b) lies on

A. $x^2 - y^2 = 1$

B. $x^2 + y^2 = 1$

C. $4x^2 - 9y^2 = 1$

D. $4x^2 + 9y^2 = 1$

Answer: C

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297. The harmonic conjugate of P (-9, 12, -15) with respect to the line segment AB, where A = (1, -2, 3) and B = (-4, 5, -6) is

A. $\left(-\frac{2}{3}, \frac{1}{3}, 0\right)$

B. (6, -9, 12)

C. $\left(-\frac{7}{3}, \frac{8}{3}, -3\right)$

D. $\left(\frac{7}{3}, -\frac{8}{3}, \frac{9}{3}\right)$

Answer: C

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298. If the direction ratios of the lines L_1 and L_2 are 2, -1, 1 and 3, -3, 4 respectively, then the direction cosines of a line that is perpendicular to both L_1 and L_2 are

A. $\pm\frac{2}{\sqrt{6}}, \pm\frac{1}{\sqrt{6}}, \pm\frac{1}{\sqrt{6}}$

B. $\pm\frac{1}{\sqrt{35}}, \pm\frac{5}{\sqrt{35}}, \pm\frac{3}{\sqrt{35}}$

C. $\pm\frac{3}{\sqrt{34}}, \pm\frac{3}{\sqrt{34}}, \pm\frac{4}{\sqrt{34}}$

D. $\pm\frac{1}{\sqrt{14}}, \pm\frac{2}{\sqrt{14}}, \pm\frac{3}{\sqrt{14}}$

Answer: B

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299. If the equation of the plane bisecting the line segment joining the points P (3, 2, 4) and Q (-1, 0, -2) and perpendicular to PQ is ax + by + cz + d = 0, then ac + bd

A. A 0

B. B 12

C. C 6

D. D1

Answer: A

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300. $\cos\left[\lim_{x \to \infty} \frac{2\pi|x| + \pi x}{|x| - 3x} + \lim_{x \to 0} \frac{\cos\left(\frac{\pi}{2}\cos^2 x\right)}{x^2}\right]$

A. 1

B. -1

C. 0

D. $\frac{1}{\sqrt{2}}$

Answer: B

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301. $\lim_{n \to \infty} \frac{\left[6^2 + 12^2 + 18^2 + ... + (6n)^2\right]^2}{[5 + 10 + 15 + ... + 5n]\left[2^3 + 4^3 + 6^3 + ... + 8n^3\right]}$

A. $\frac{4}{5}$

B. $\frac{144}{5}$

C. $\frac{4}{25}$

D. $\frac{144}{25}$

Answer: B

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302. If [x] denotes the greatest integer not exceeding the number x, then f(x) defined by

$f(x) = \begin{cases} [x] & \text{if } x < 2 \\ [x] - 1 & \text{if } x \geq 2 \end{cases}$ is continuous in the interval.

A. $[1, 2] \cup (2, 3)$

B. [1, 3)

C. (1, 3)

D. R

Answer: B

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303. $f(x) = \left(\frac{a+x}{1+x}\right)^{a+1+2x}$ show that $f'(0) = a^{a+1}\left(2\log a + \frac{1-a^2}{a}\right)$

A. a^{a+1}

B. $a^{a+1}\left\{\frac{1-a^2}{a} + 2\log a\right\}$

C. 2loga

D. $a^{a+1}\left\{\dfrac{(1+a)^2}{a-2\log a}\right\}$

Answer: B

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304. If $y=\log_2(\log_2 x), \quad \text{then } \dfrac{dy}{dx}=$

A. $\dfrac{\log_2 e}{2x\log_e x}$

B. $\dfrac{1}{x\log_e x\log_e 2}$

C. $\dfrac{1}{\log_e (2x)^x}$

D. $\dfrac{1}{\log_e e\log_e x}$

Answer: B

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305. If $y = x \log\left(\frac{x}{2-3x}\right)$ for $0 < x < \frac{2}{3}$, then $\frac{d^2y}{dx^2}$ at $x = \frac{1}{2}$ is

A. 4

B. 16

C. 32

D. 2

Answer: C

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306. An approximate value of $\sqrt[4]{18}$ is

A. 2.0512

B. 2.0425

C. 2.0625

D. 2.0834

Answer: C

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307. The sum of the maximum and the minimum values of $3x^4 - 2x^3 - 6x^2 + 6x + 4$, in (0, 2) is

A. 28

B. $\frac{167}{16}$

C. $\frac{134}{15}$

D. $\frac{87}{16}$

Answer: B

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308. The constant c of Lagrange's mean value theorem for $f(x) = \cos x - \sin 2x$ in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is

A. 0

B. $\sin^{-1}\left(\frac{1 \pm \sqrt{33}}{8}\right)$

C. $\cos^{-1}\left(\frac{1 \pm \sqrt{33}}{8}\right)$

D. $\pm \frac{\pi}{4}$

Answer: B

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309. Air is discharging from a large spherical balloon at the rate of 4 cubic meters per minute. Then, the rate at which the surface area is shrinking when the radius of the balloon is 8 m, is

A. $2m^2 / \min$

B. $1m^2 / \min$

C. $4m^2 / \min$

D. $8m^2 / \min$

Answer: B

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310. Evaluate: $\int \frac{x}{x^2+3x+2} dx$

A. $\frac{2}{9}\log\left|\frac{x-1}{x+2}\right| + c$

B. $\frac{2}{9}\log\left|\frac{x+2}{x-1}\right| + c$

C. $\frac{1}{3}\frac{1}{x-1} + \frac{2}{9}\log\left|\frac{x-1}{x+2}\right| + c$

D. $-\frac{1}{3}\frac{1}{(x-1)} + \frac{2}{9}\log\left|\frac{x-1}{x+2}\right| + c$

Answer: D

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311. $\int \frac{\sqrt{x^2+1}\left[\log(x^2+1)-2\log x\right]}{x^4}$dx is equal to

A. $\frac{1}{9}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}}\left[2-3\log\left(1+\frac{1}{x^2}\right)\right]+c$

B. $\frac{1}{3}\left(1+\frac{1}{x^2}\right)^{\frac{1}{2}}\left[6-\log\left(1+\frac{1}{x^2}\right)^2\right]+c$

C. $\frac{1}{9}\left(1+\frac{1}{x^2}\right)\left[3-2\log\left(1+\frac{1}{x^2}\right)^{\frac{1}{2}}\right]+c$

D. $\frac{1}{3}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}}\left[3-\log\left(1+\frac{1}{x^2}\right)\right]+c$

Answer: A

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312. Evaluate the following integrals

$$\int \frac{dx}{\sin x + \sin 2x}$$

A. $\frac{1}{6}\log(1-\cos x)+\frac{1}{2}\log(1+\cos x)+\frac{2}{3}\log|1+2\cos x|+c$

B. $\frac{1}{6}\log(1-\cos x)-\frac{1}{2}\log(1+\cos x)-\frac{2}{3}\log|1+2\cos x|+c$

C. $\frac{1}{6}\log(1-\cos x)+\frac{1}{2}\log(1+\cos x)-\frac{2}{3}\log|1+2\cos x|+c$

D. $\frac{1}{6}\log[(1-\cos x)(1+\cos x)|1+2\cos x|]+c$

Answer: C

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313. $\int(\sec^4 x+\tan^4 x)dx =$

A. $\frac{2}{3}\tan^3 x-\frac{2}{3}\tan x+x+c$

B. $\frac{1}{3}\sec^2 x\tan x+\frac{5}{3}\tan x+\frac{\tan^3 x}{3}+x+c$

C. $\frac{2}{3}\tan^3 x+x+c$

D. $\frac{1}{3}\sec^2 x\tan x-\frac{5}{3}\tan x+\frac{\tan^3 x}{3}+x+c$

Answer: C

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314.

$$\lim_{n \to \infty} \frac{1}{n}\left\{\sin^5\left(\frac{\pi}{6n}\right) + \sin^5\left(\frac{2\pi}{6n}\right) + \sin^5\left(\frac{3\pi}{6n}\right) + \ldots + \sin^5\left(\frac{\pi}{2}\right)\right\} =$$

A. $\frac{8}{15\pi}$

B. $\frac{8}{5\pi}$

C. $\frac{32}{5\pi}$

D. $\frac{16}{5\pi}$

Answer: D

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315. $\int_0^{\frac{\pi}{2}} \log(\sin 2x)dx$

A. $\pi \log 2$

B. $-\pi \log 2$

C. $\frac{\pi}{2}\log 2$

D. $-\frac{\pi}{2}\log 2$

Answer: D

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316. The area (in sq units) between the curve $y^2 = 8x$ and its latus rectum is

A. $\frac{32}{3}$

B. $\frac{64}{3}$

C. $\frac{16}{3}$

D. $\frac{8\sqrt{2}}{3}$

Answer: A

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317. The order and the degree of the differential equation $y = px + \sqrt{a^2p^2 + b^2}$, (where $p = \frac{dy}{dx}$) are respectively.

A. 2, 1

B. 1, 2

C. 1, 1

D. 2, 2

Answer: B

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318. The solution of the differential equation $\frac{dx}{dy} + 2yx = 2y$ which passes through the point (2, 0) is

A. $(x - 1) = 2e^{y^2}$

B. $(x - 1) = 2e^{-y^2}$

C. $(x - 1) = e^{y^2}$

D. $(x-1)=e^{-y^2}$

Answer: D

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