MATHS

BOOKS - TS EAMCET PREVIOUS YEAR PAPERS

AP EAMCET ENGINEERING ENTRANCE EXAM ONLINE QUESTION PAPER 2019 (SOLVED)

Mathematics

1. Let A and B be finite sets and P_A and P_B respectively denote their power sets . If P_B has 112. elements more than those in P_A then the number of functions from A to B which are injective is

A. 224

B. 56

C. 120

D. 840

Answer: D

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2. Let $D = \left\{x \in R : f(x) = \sqrt{\frac{x - |x|}{x - |x|}} \text{is difined}\right\}$

and C be the range of the real function

$g(x) = \frac{2x}{4 + x^2}$. then$D \cap C =$

A. $\left[-\frac{1}{2}, \frac{1}{2}\right]$

B. $\left(0, \frac{1}{2}\right)$

C. R^+

D. $R^+ - Z^+$

Answer: B

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3. which of the following is divisible by $x^2 - y^2 \, \forall x \neq y$?

A. $x^n - y^n, \forall n \in N$

B. $x^n + y^n, \forall n \in N$

C. $(x^n - y^n)\left(x^{2n+1} + y^{2n+1}\right), \forall n \in N$

D. $(x^n - y^n)(x^m + y^m), \forall m, n \in N$

Answer: C

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4. If A = $\begin{vmatrix} p & q & r \\ r & p & q \\ q & r & p \end{vmatrix}$ and $AA^T = I \text{then} p^3 + q^3 + r^3$ =

A. ± 1

B. pqr

C. 3pqr

D. $3pqr \pm 1$

Answer: D

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5. Match the items of List-I with the items of List - II and choose the correct option.

List I		List II
A. If A is a non singular matrix of order 3 and $\lvert A \rvert = a$, then $\lvert (\text{adj } A^{-1})^{-1} \rvert =$	I.	null matrix
B. A is a non singular matrix of order 3 and B is any matrix of order 3 such that $AB = O$, then B is	II.	a^2
C. $\begin{vmatrix} 1 & x & x^2 \\ \cos(a-b)y & \cos ay & \cos(a+b)y \\ \sin(a-b)y & \sin ay & \sin(a+b)y \end{vmatrix}$ does not depend on	III.	b
D. A is a square matrix of order 3 and $B = A - A^T$, then $\lvert B \rvert$ is	IV.	a
	V.	0

A. $\begin{matrix} A & B & C & D \\ II & IV & III & I \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ III & I & IV & V \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ II & V & III & I \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ II & I & IV & V \end{matrix}$

Answer: D

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6. The solution of the linear system of equations

$$\begin{bmatrix} 2 & 2 & 3 \\ 7 & 1 & 1 \\ 0 & 6 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3y+11 \\ 6z-1 \\ 5y+11 \end{bmatrix} + \begin{bmatrix} x \\ x \\ 4z \end{bmatrix} + \begin{bmatrix} z \\ 3x \\ 4y \end{bmatrix} is$$

A. x = 4, y = - 3, z = - 2

B. x = 2, y = 1, z=1

C. x = 1, y=-1, z = 2

D. x = 2, y = - 4, z = 3

Answer: A

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7. If a b, are the least and the greatest values respectively $|z_1 + z_2|$, where $z_1 = 12 + 5i$ and $|z_2| = 9, then a^2 + b^2$ =

A. 468

B. 500

C. 250

D. 450

Answer: B

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8. If a complex number z is such that $(7+i)(z+\bar{z}) - (4+i)(z-\bar{z}) + 116i = 0$, then $z \cdot \bar{z} =$

A. 400

B. 300

C. 200

D. 100

Answer: C

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9. Let the point P pepresent $z = x + iy, x, y \in R$ in the argand plane .

Let the curves C_1 and C_2 be the loci of P satisfying the conditions

(i) $\frac{2z+i}{z-2}$ is purely imaginary and

$(ii) Arg\left(\frac{z+i}{z+1}\right) = \frac{\pi}{2}$ respectively . Then the point of intersection of the curves C_1 and C_2 , other than the origin, is

A. (1,2)

B. $\left(\frac{2}{7}, -\frac{5}{7}\right)$

C. $(-3, 4)$

D. $\left(\frac{5}{37}, -\frac{30}{37}\right)$

Answer: D

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10. If $z = \cos 6^\circ + i\sin 6^\circ$, then $\sum_{n=1}^{20} \left(z^{2n-1}\right) =$

A. 0

B. -1

C. $\frac{-3}{4\sin 6^\circ}$

D. $\frac{3}{4\sin 6^\circ}$

Answer: D

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11. If α, β are the real roots of $x^2 + px + q = 0$ and α^4, β^4 are the roots of $x^2 - rx + s = 0$, then the equation $x^2 - 4qx + 2q^2 - r = 0$ has always

A. two positive roots

B. two negative roots

C. one positive root and one negative root

D. two real roots

Answer: D

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12. If $\frac{x-p}{x^2-3x+2}$ takes all real values for $x \in R$ then the range of P is

A. $1 \leq P \leq 2$

B. $1 < P < 2$

C. $P < 1 \text{ or } P > 2$

D. $P \geq 2 \text{ or } P \leq 1$

Answer: A

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13. $\left\{x \in R: \frac{\sqrt{6+x-x^2}}{2x+5} \geq \frac{\sqrt{6+x-x^2}}{x-4}\right\} =$

A. [-2,3]

B. $(-\infty, -4] \cup \left[\frac{-5}{2}, -1\right]$

C. $[-2, -1] \cup \{3\}$

D. $(-\infty, -4] \cup [-2, -1]$

Answer: C

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14. Let θ be a an acute angle such that the equation $x^3 + 4x^2 \cos\theta + x \cot\theta = 0$ has multiple roots. Then the value of θ (in radians) is

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

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

C. $\frac{\pi}{12}$ or $\frac{5\pi}{12}$

D. $\frac{\pi}{6}$ or $\frac{5\pi}{12}$

Answer: C

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15. six persons A, B, C, D, E and F are to be seated at a circular table facing towards the centre. Then the number of ways that can be done if A must have either E or F on his immediate right and E must have either F or D on his immediate right, is

A. 18

B. 30

C. 12

D. 24

Answer: A

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16. Number of ways of forming a committee of 6 members out of 5 Indians. 5 Americans and 5 Australians such that there will be atleast one member from each county in the committee is

A. 3375

B. 4375

C. 3875

D. 4250

Answer: B

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17. If 'a' the middle term in the expansion of $(2x-3y)^8$ and b,c are the middle terms in the expansion of $(3x+4y)^7$, then the value of $\frac{b+c}{a}$, when x = 2 and y = 3 , is

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

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

C. 1

D. 2

Answer: D

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18. The first negative coefficient in the terms occurring in the expansion of $(1+x)^{\frac{21}{5}}$ is

A. $\frac{-6160}{15625}$

B. $\frac{-416}{3125}$

C. $\frac{-616}{5^7}$

D. $\frac{-616}{5^6}$

Answer: C

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19. When $|x| < \frac{1}{2}$, the coefficient of x^4 in the expansion of $\frac{3x^2 - 5x + 3}{(x-1)(2x+1)(x+3)}$ is

A. $\frac{722}{27}$

B. $\frac{724}{27}$

C. $\frac{-722}{27}$

D. $\frac{-724}{27}$

Answer: C

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20. Let

$x = a\sin^{\alpha}\theta\cos^{\alpha+1}\theta, y = a\sin^{\alpha+1}\theta\cos^{\alpha}\theta, \left(\theta \neq \frac{n\pi}{2}\right)$. If $\frac{(x^2+y^2)^m}{(xy)^n}$

is independent of θ, then the relation between α m and n is

A. $2m\alpha = n(2\alpha + 1)$

B. $m + n = \alpha$

C. $2m\alpha = 2n\alpha + m$

D. $2m = (2n + 1)\alpha$

Answer: A

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21. Assertion (A) : If $\sqrt{4\sin^4\theta + \sin^2 2\theta} + 4\cos^2\left(\frac{\pi}{4} - \frac{\theta}{2}\right) = 2$, then θ lies in 3rd quadrant or 4th quadrant .

Reason : (R) $\sqrt{\sin^2\theta} = \sin\theta$

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

B. Both (A) and (R) 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: C

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22. If $x = \frac{\sin^3\theta}{\cos^2\theta}$ and $y = \frac{\cos^3\theta}{\sin^2\theta}$, where $\sin\theta + \cos\theta = \frac{1}{2}$, then $x + y =$

A. $\frac{48}{9}$

B. $\frac{34}{9}$

C. $\frac{65}{18}$

D. $\frac{79}{18}$

Answer: D

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23. If 4 $\left(\sin 2x \sin 4x + \sin^2 x\right) = 3$, then x =

A. $\frac{2n\pi}{3} \pm \frac{\pi}{9}, n \in Z$

B. $\frac{n\pi}{3} \pm \frac{\pi}{9}, n \in Z$

C. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{9}, n \in Z$

D. $\frac{n\pi}{3} + (-1)^n \frac{2\pi}{9}, n \in Z$

Answer: B

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24. If $\sum_{k=1}^{n} \tan^{-1}\left(\frac{1}{k^2+k+1}\right) = \tan^{-1}(\theta), \quad \text{then} \quad \theta =$

A. $\frac{n}{n+2}$

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

C. 1

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

Answer: A

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25. $e^{\left(\sec h^{-1}\frac{1}{2}+\tan h^{-1}\frac{1}{2}+\sin h^{-1}\frac{1}{2}\right)}=$

A. $\dfrac{2+3\sqrt{3}+3\sqrt{5}+3\sqrt{15}}{2}$

B. $\dfrac{3+2\sqrt{3}+3\sqrt{5}+2\sqrt{15}}{2}$

C. $\dfrac{2=3\sqrt{3}+4\sqrt{5}+5\sqrt{15}}{2}$

D. $\dfrac{2+3\sqrt{3}-4\sqrt{5}+5\sqrt{15}}{2}$

Answer: B

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26. In ΔABC if a: b: c = 3 : 5: 7 , then , cos A + cos B =

A. $\dfrac{13}{7}$

B. $\dfrac{11}{7}$

C. $\dfrac{12}{7}$

D. $\frac{10}{7}$

Answer: C

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27. If ABCD is a cyclic quadrilateral with AB = 6 , BC = 4, CD = 5, DA= 3 and $\angle ABC = \theta$, then cos θ =

A. A $\frac{3}{13}$

B. B $\frac{18}{76}$

C. C $\frac{16}{78}$

D. D $\frac{78}{86}$

Answer: A

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28. Let a triangle ABC be inscribed in a circle of radius 2 units. If the 3 bisectors of the angles A, B and C are extended to cut the circle at A_1, B_1 and C_1 respectively, then the value of

$$\left[\frac{AA_1\cos\frac{A}{2} + BB_1\cos\frac{B}{2} + CC_1\cos\frac{C}{2}}{\sin a + \sin B + \sin C}\right]^2 =$$

A. 4

B. 16

C. 25

D. 1

Answer: B

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29. Let D and E be the midpoints of the sides AC and BC of a triangle ABC respectively . If O is an interior point of the triangle ABC such that OA + 2OB + 3OC = 0 , then the area (in sq units) of the triangle ODE is

A. 6

B. 5

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

D. 0

Answer: D

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30. The vector equation of the plane passing through the points $(1, -2, 5), (0, -5, -1)$ and $(-3, 5, 0)$ is

A. $r = (1 - \lambda - 4\mu)\hat{i} - (2 + 3\lambda - 7\mu)\hat{j} + (5 - 6\lambda - 5\mu)\hat{k}$

B. $r = (1 + \lambda + 4\mu)\hat{i} - (2 - 3\lambda + 7\mu)\hat{j} + (5 - 6\lambda - 5\mu)\hat{k}$

C. $r = (1 - \lambda + 4\mu)\hat{i} - (2 + 3\lambda + 7\mu)\hat{j} + (5 - 6\lambda + 5\mu)\hat{k}$

D. $r = (1 + \lambda - 4\mu)\hat{i} + (2 + 3\lambda - 7\mu)\hat{j} + (5 + 6\lambda - 5\mu)\hat{k}$

Answer: A

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31. The angle made by the vector $2\hat{i} - \hat{j} + \hat{k}$ with the plane represented by $r \cdot \left(\hat{i} + \hat{j} + 2\hat{k}\right)$ = 7 is

A. 30°

B. 60°

C. 45°

D. 75°

Answer: A

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32. If a, b, c are non-zero , non-collinear vectors and $a \times b = b \times c = c \times a$, then a + b+ c =

A. 3a

B. 0

C. $3(a \times b)$

D. $3(b \times c)$

Answer: B

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33. If $V = 2\hat{i} + \hat{j} - \hat{k}, W = \hat{i} + 3\hat{k}$ and U is a unit vector , then the maximum value of [U V W] is

A. $\sqrt{57}$

B. $\sqrt{59}$

C. $\sqrt{60}$

D. $\sqrt{10} + \sqrt{6}$

Answer: B

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34. Assertion (A) : If a, b are two non collinear vectors, then the vector component of b along the line perpendicular to a is $\frac{a \times (b \times a)}{|a|^2}$

Reason (R) : $a \times (b \times c) = (a. c)b - (a. B)c$ and vector component of b on c is $\left(b \cdot \frac{c}{|c|}\right)\frac{c}{|c|}$

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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35. The standard deviations of $x_i(i=1,2,\ldots,10)$ and $y_i(i=1,\ldots,10)$ are respectively 'a' and 'b' . $\bar{x},\bar{y}$ are the means of these two sets of observation respectively . If $z_i=(x_i-\bar{x})(y_i-\bar{y})$ and $\sum_{i=1}^{10} z_i=c$ then the standard deviations of the observation $=(x_i-y_i),(i=1,2,\ldots,10)$ is

A. $\sqrt{a^2+b^2+\frac{c}{5}}$

B. $\sqrt{a^2+b^2-\frac{c}{5}}$

C. $\sqrt{a^2+b^2-\frac{c^2}{5}}$

D. $\sqrt{a^2+b^2+\frac{c^2}{5}}$

Answer: B

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36. For a group of 100 students, the mean $\bar{x}_1$ and the standard deviation σ_1 of their marks were found to be 40 and 15 respectively. Later it was observed that the scores 40 and 50 were misread as 30 and 60 respectively. If the mean and the standard deviation with the corrected observations of the scores, are $\bar{x}_2$ and σ_2 respectively , then

A. $\bar{x} = \bar{x}_2, \sigma_1 = \sigma_2$

B. $\bar{x}_1 = \bar{x}_2, \sigma_1 < \sigma_2$

C. $\bar{x}_1 = \bar{x}_2, \sigma_1 > \sigma_2$

D. $\bar{x}_1 > \bar{x}_2, \sigma_1 = \sigma_2$

Answer: C

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37. If two unbiased dice are rolled simultaneously unitl a sum of the number appered on these dice is either 7 or 11, then the probability that 7 comes before 11, is

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

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

C. $\frac{5}{9}$

D. $\frac{5}{18}$

Answer: B

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38. If A and B throw two dice 100 times each simultaneously, then the probability that both of them will get even number as the total at the same time in all the throws is

A. $\left(\frac{1}{6}\right)^{100}$

B. $\left(\frac{1}{4}\right)^{100}$

C. $\left(\frac{1}{2}\right)^{100}$

D. $\left(\frac{3}{4}\right)^{100}$

Answer: A

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39. The probabilities of having a defective toy in three cartons , A , B, C are $\frac{1}{3}, \frac{1}{4}, \frac{2}{5}$ respectively. If a carton is selected at random and a toy drawn randomly from it is found to be defective, then probability that it is drawn from carton B is

A. $\frac{15}{47}$

B. $\frac{20}{47}$

C. $\frac{20}{59}$

D. $\frac{15}{59}$

Answer: D

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40. A die is thrown twice. If getting a number greater than four on the die is considered a succes. Then the variance of the probability distribution of the number of successes is

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

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

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

D. $\frac{8}{9}$

Answer: C

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41. If X is a poisson variate such that 2P(X = 1) = 5P (X = 5)+(2P(X = 3), then the standard deviation of X is

A. 4

B. 2

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

D. $\sqrt{2}$

Answer: D

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42. If the sum of the distance from a variable point P to the given points A(1,0) and B(0,1) is 2, then the locus of P is

A. $3x^2 + 3y^2 - 4x - 4y = 0$

B. $16x^2 + 7y^2 - 64x - 48y = 0$

C. $3x^2 = 2xy + 3y^2 - 4x - 4y = 0$

D. $16x^2 + 38xy + 7y^2 - 64x - 48y = 0$

Answer: C

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43. If the equation of a curve C is transformed to $9x^2 + 25y^2 = 225$ be the rotation of the coordinate axes about the origin through an angle $\frac{\pi}{4}$ in the positive direction then the equation of the curve C, before the transformation is

A. $17x^2 + 16xy + 17y^2 = 225$

B. $17x^2 + 23y^2 = 391$

C. $17x^2 - 16xy + 17y^2 = 225$

D. $23x^2 + 17y^2 = 391$

Answer: C

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44. A straight line 4x +y -1 = 0 through the point A(2,-7) meets the line BC whose equation is 3x - 4y +1 at the point B . Then the equation of the line AC such that AB = AC , is

A. 89x - 52y - 162 = 0

B. 52x + 89y + 519 = 0

C. 4x - y - 15 = 0

D. 4x +3y +13 = 0

Answer: B

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45. In a $\Delta ABC, 2x+3y+1=0, x+2y-2=0$ are the perpendicular bisectors of its sides AB a nd AC respectively and if A = (3,2) , then the equation of the side BC is

A. x + y - 3 = 0

B. x - y - 3 = 0

C. 2x - y - 2 = 0

D. 2x + y - 2 = 0

Answer: B

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46. If the perpendicular bisector of the line segment joining $A(\alpha, 3)$ and B(2,-1) has y-intercept 1, then $\alpha =$

A. 0

B. ± 1

C. ± 2

D. ± 3

Answer: C

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47. the number of values of a for which the pair of lines represented by $3ax^2 + 5xy + (a^2 - 2)y^2 = 0$ are at right angles to each other , is

A. 2

B. 1

C. infinitely many

D. 0

Answer: A

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48. If the pair of lines joining the origin and the points of intersection of the line ax +by = 1 and the curve $x^2 + y^2 - x - y - 1 = 0$ are at right angles , then the locus of he point (a,b) is a circle of radius

A. 2

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

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

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

Answer: C

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49. If the lines $x + 2y - 5 = 0$ and $2x - 3y + 4 = 0$ lie along diameters of a circle of area is 9π then the equation of the circle is

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

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

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

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

Answer: A

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50. Given that $a > 2b > 0$ and that the line $y = mx - b\sqrt{1 + m^2}$ is a common tangent to the circles $x^2 + y^2 = b^2$ and $(x - a)^2 + y^2 = b^2$.

Then the positive value of m is

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

B. $\dfrac{b}{a - 2b}$

C. $\dfrac{\sqrt{a^2-4b^2}}{2b}$

D. $\dfrac{2b}{\sqrt{a^2-4b^2}}$

Answer: D

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51. Two circles each of radius 5 units touch each other at (1,2) and 4x +3y = 10 is their common tangent. The equation of that circle among the two given circles, such that some portion of it lies in every quadrant is

A. $x^2+y^2+6x+2y+15=0$

B. $x^2+y^2+2x+6y-15=0$

C. $x^2+y^2+6x+2y-15=0$

D. $x^2+y^2-6x+2y-15=0$

Answer: C

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52. If the angle between the circles $x^2+y^2+4x-5=0$ and $x^2+y^2+2\lambda y-4=0$ is $\frac{\pi}{3}$, then $\lambda=$

A. $\pm\sqrt{5}$

B. ± 2

C. $\pm\sqrt{3}$

D. $\pm\sqrt{6}$

Answer: A

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53. The equation of a circle passing through the points of intersection of the circles

$x^2+y^2-4x-6y-12=0$

$x^2+y^2+6x+4y-12=0$ and having radius $\sqrt{13}$ is

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

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

C. $x6(2) + y^2 - 2y - 13 = 0$

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

Answer: D

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54. The normal at a point on the parabola $y^2 = 4x$ passes through (5,0). If two more normals to this parabola also pass through(5,0), then centroid of the triangle formed by the feet of these three normal is

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

B. $(2, 0)$

C. (5,0)

D. (0,2)

Answer: B

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55. The equation of the normal to the parabola $y^2 = 4x$ which is perpendicular to x + 3y +1 = 0 is

A. 3x - y = 33

B. 3x - y +33 = 0

C. 3x + y = 33

D. 3x + y + 33 = 0

Answer: A

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56. Let P be any point on the ellipse $7x^2 + 16y^2 = 112$, S be a focus , L be the corresponding directrix and PM be the perbendicular distance from P directrix L . Then $\frac{SP}{PM}$

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

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

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

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

Answer: C

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57. Tangents are drawn to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$ at the ends of latus rectum. The area of the quadrilateral formed, is

A. 27

B. $\frac{15}{4}$

C. $\frac{13}{2}$

D. 45

Answer: A

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58. A hyperbola with centre at (0,0) has its transverse axis along X - axis whose length is 12 if (8,2) is a point on the hyperbola , then its eccentricity is

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

B. $\frac{2\sqrt{2}}{\sqrt{7}}$

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

D. $\frac{9}{7}$

Answer: B

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59. In a triangle ABC , if the mid-points of sides AB, BC, CA are (3,0,0), (0,4,0),(0,0,5) respectively, then $AB^2 + BC^2 + CA^2 =$

A. 50

B. 200

C. 300

D. 400

Answer: D

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60. The angle between a line with direction ratios 2,2,1 and the line joining the points (3,1,4) and (7,2,12) is

A. $\cos^{-1}\left(\frac{2}{3}\right)$

B. $\cos^{-1}\left(\frac{3}{4}\right)$

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

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

Answer: A

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61. The equation of the plane in normal form which passes through the points (-2,1,3) ,(1,1,1) and (2,3,4) is

A. $\left(\frac{2}{3}\right)x+\left(-\frac{2}{3}\right)y+\left(\frac{1}{3}\right)x=\frac{1}{3}$

B. $\left(-\frac{2}{3}\right)x+\left(\frac{2}{3}\right)y+\left(-\frac{1}{3}\right)x=\frac{1}{3}$

C. $\left(-\frac{2}{3}\right)x+\left(\frac{2}{3}\right)y+\left(-\frac{1}{3}\right)x=\frac{1}{3}$

D. $\left(\frac{4}{\sqrt{173}}\right)x+\left(\frac{-11}{\sqrt{173}}\right)y+\left(\frac{6}{\sqrt{173}}\right)x=\frac{1}{\sqrt{173}}$

Answer: C

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62. If $\alpha = \lim_{x \to 0} \frac{x \cdot 2^x - x}{1 - \cos x}$ and $\beta = \lim_{x \to 0} \frac{x \cdot 2^x - x}{\sqrt{1 + x^2} - \sqrt{1 - x^2}}$ then

A. $\alpha = 5\beta$

B. $\alpha = 2\beta$

C. $\beta = 2\alpha^2$

D. $\beta = \frac{1}{6}\alpha$

Answer: B

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63. $\lim_{n \to \infty} \left(\frac{1}{3.7} + \frac{1}{7.11} + \frac{1}{11.15} + \ldots + (n \ \ \text{terms} \ ) \right) =$

A. $\frac{1}{12}$

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

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

D. 0

Answer: A

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64. $\lim_{x \to \infty} \left[\sqrt{x^2 + ax + b} - x\right](a < 0 < b)$

A. depends on both a nad b

B. depends only on b

C. depends only on a

D. does not depend on a and b

Answer: C

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65. If α and β are such that the function f (x)

defined by f (x) = $\begin{cases} \alpha x^2 - \beta, & \text{for} |x| < 1 \\ \frac{-1}{|X|}, & \text{for} |x| \geq 1 \end{cases}$

is differentiable everywhere, then the ordered pair (α, β) =

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

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

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

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

Answer: C

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66. If y = $\sin^2\left(\cot^{-1}\sqrt{\frac{1+x}{1-x}}\right)$, then $\frac{dy}{dx}$ =

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

B. $\frac{1}{1+x}$

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

D. 1

Answer: A

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67. If

$a \neq b, x \neq n\pi n \in Z$ and $y^2 = a^2 \cos^2 x + b^2 \sin^2 x$, then $\frac{d^2y}{dx^2} + y =$

A. $\left(\frac{ab}{y}\right)^2$

B. $\frac{1}{y}\left(\frac{ab}{y}\right)^2$

C. $\frac{(ab)^2}{y}$

D. $\frac{ab}{y^3}$

Answer: B

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68. If 2y = 3 x - 1 is a tangent drawn to the curve $y^2 = ax^3 + b$ at (1.1)

where a, b are constatns then (a,b) =

A. (1,0)

B. (0,1)

C. (1,-1)

D. (-1,1)

Answer: A

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69. A ladder of 5 meters long rests against a vertical wall with the lower end on the horizontal ground.

. The lower end of the ladder is pulled along the ground away from the wali at the rate 3m/sec. The height of the upper end (in meters) while it is descending at the rate of 4m/sec, is

A. 1

B. 2

C. 3

D. 4

Answer: C

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70. Suppose f''(x) exists for all real x. if f(2) = 2, f(3) = 5 and f(4) = 10, then which one among the following statements is definitely true?

A. $f''(x) < 1 \quad \text{for some} \quad x \in (2, 4)$

B. $f''(x) > 1 \quad \text{for some} \quad x \in (2, 4)$

C. $f''(x) = 1 \quad \text{for some} \quad x \in (2, 4)$

D. $f''(x) = 0 \quad \text{for some} \quad x \in (2, 4)$

Answer: B

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71. If p and q are respectively the global maximum and global minimum of the function f(x) $= x^2 e^{2x}$ on the interval [-2,2], then $pe^{-4} + qe^4 =$

A. 0

B. $4e^8$

C. 4

D. $4e^8 + 1$

Answer: C

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72. $\int \frac{x + \sin x}{1 + \cos x} dx =$

A. $\log_e(1 + \cos x) + c$

B. $x \frac{\sin^2(x)}{2} + c$

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

D. $x \quad \tan \frac{x}{2} + c$

Answer: D

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73. $\int x^2 \left[\sqrt{2}\left(\frac{\pi}{4} + x\right) + e^x\right] dx =$

A.

$\left(x^2 + 2x - 2\right)\sin x + \left(-x^2 + 2x + 2\right)\cos x + \left(x^2 - 2x + 2\right)e^x + c$

B.

$\left(-x^2 + 2x + 2\right)\sin x + \left(x^2 + 2x - 2\right)\cos x + \left(x^2 - 2x + 2\right)e^x + c$

C.

$\left(x^2 + 2x + 2\right)\sin x + \left(-x^2 - 2x - 2\right)\cos x + \left(x^2 - 2x + 2\right)e^x + c$

D.

$\left(x^2 - 2x - 2\right)\sin x + \left(-x^2 + 2x - 2\right)\cos x + \left(x^2 - 2x + 2\right)e^x + c$

Answer: A

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74. $\int \frac{dx}{(x-1)^2(x^2+1)} =$

A. $\log_e \sqrt{x+1} + \frac{1}{2}\log_e \sqrt{x^2+1} - \frac{1}{x+1} + c$

B. $\log_e \sqrt{x+1} - \frac{1}{2}\log_e \sqrt{x^2+1} - \frac{1}{2(x+1)} + c$

C. $\frac{1}{2}\log_e \sqrt{x+1} - \frac{1}{4}\log_e \sqrt{x^2+1} + \frac{1}{2(x-1)} + c$

D. $\frac{1}{4}\log_e \sqrt{x+1} + \frac{1}{2}\log_e \sqrt{x^2+1} + \frac{1}{x+1} + c$

Answer: B

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75. For

$n \geq 2$, if $I_n = \int (\sin x + \cos x)^n dx$ then $nI_n - 2(n-I)I_{n-2} =$

A. $(\sin x + \cos x)^{n+1}(\sin x - \cos x) + c$

B. $(\sin x + \cos x)^n(\sin x - \cos x) + c$

C. $(\sin x + \cos x)^{n-1}(\sin x - \cos x) + c$

D. $(\sin x - \cos x)^{n-1}(\sin x + \cos x) + c$

Answer: C

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76. $\lim_{n \to \infty} \dfrac{\sqrt{1} + \sqrt{2} + \ldots + \sqrt{n}}{n^{3/2}} =$

A. 0

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

C. 1

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

Answer: B

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77. $\int_0^{\infty} e^{-x} \sin^6 x dx =$

A. $\frac{24}{85}$

B. $\frac{124}{285}$

C. $\frac{136}{529}$

D. $\frac{144}{629}$

Answer: D

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78. The area (in sq. units) bounded by the curve $y = x^2 + 2x + 1$ and the tangent to it at (1,4) and the y -axis is

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

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

C. 1

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

Answer: A

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79. The differential equation formed by eliminating a and b from the equation $y = e^x$ (a cos x + b sin x) is

A. $2\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$

B. $2\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 2y = 0$

C. $2\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = 0$

D. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$

Answer: D

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80. If $y = A(x)e^{-\int p dx}$ is a solution of $\frac{dy}{dx} + P(x)y = Q(x)$, then A'(x) =

A. $e^{\int p dx}$

B. $Q(x)e^{-\int p dx}$

C. $\int Q(x)e^{\int p dx} dx$

D. $Q(x)e^{\int p dx}$

Answer: D

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