MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

KARNATAKA CET 2010

Mathematics

1. The chord of the circle $x^2 + y^2 - y^2 - 4x = 0$ which is bisected at $(1, 0)$ is perpendicular to the line

A. $x + y = 0$

B. $y = x$

C. $y = 1$

D. $x = 1$

Answer: C

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2. In ΔABC, if $a = 2, b = \tan^{-1}\frac{1}{2}$ and $C = \tan^{-1}\frac{1}{3}$ then (A,b)=

A. $\left(\frac{\pi}{4}, \frac{2\sqrt{2}}{\sqrt{5}}\right)$

B. $\left(\frac{3\pi}{4}, \frac{2}{\sqrt{5}}\right)$

C. $\left(\frac{\pi}{4}, \frac{2}{\sqrt{5}}\right)$

D. $\left(\frac{3\pi}{4}, \frac{2\sqrt{2}}{\sqrt{5}}\right)$

Answer: D

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3. The straight line $2x + 3y - k = 0, k > 0$ cuts the X and Y-axes at A and B. The area of ΔOAB, where O is the origin, is 12 sq. units. The equation of the circle having AB as diameter is

A. $x^2 + y^2 + 4x - 6y = 0$

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

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

D. $x^2 + y^2 - 6x + 4y = 0$

Answer: C

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4. LeT $p(X, Y)$ be the midpoint of the line joining (1,0) to a point on the curve $y^2 = \begin{vmatrix} x+1 & x+2 \\ x+3 & x+5 \end{vmatrix}$. The locus of P is symmetrical about

A. X-axis

B. Y-axis

C. $y = 1$

D. $X + 1$

Answer: A

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5. The function $f(x) = |x - 2| + x$ is

A. differentiable at $x = 2$ but not at $x = 0$

B. differentiable at both $x = 2$ and $x = 0$

C. continuous at both $x = 2$ and $x = 0$

D. continuous at $x = 2$ but not at $x = 0$

Answer: C

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6. If a, b are the roots of $x^3 - 5x^2 - x + 5 = 0$ b is a root of

A. $x^2 - 5x + 10 = 0$

B. $x^2 + 3x - 20 = 0$

C. $x^2 + 5x - 30 = 0$

D. $x^2 - 3x - 10 = 0$

Answer: D

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7. In the binomial expansion of $(1+x)^{15}$, the coefficients of x^r and x^{r+3} are equal. Then r is

A. 7

B. 8

C. 6

D. 4

Answer: B

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8. The n^{th} term of the series $1 + 3 + 7 + 13 + 21 + \ldots\ldots$ is 9901. The value of n is

A. 90

B. 100

C. 99

D. 900

Answer: B

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9. If $\frac{1}{(3-5x)(2+3x)} = \frac{A}{3-5x} + \frac{B}{2+3x}$,

then A.B is

A. $5:3$

B. $2:3$

C. $3:2$

D. $3:5$

Answer: A

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10. Which of the following is NOT true e?

A. $\{(p \to q) \wedge (q \to r)\} \to (p \to r)$ is a tautology

B. $(p \wedge \sim q) \leftrightarrow (p \to q)$ is a tautology

C. $\sim(p \leftrightarrow q) \equiv (p \wedge \sim q) \vee (\sim p \wedge q)$

D. $p \to (q \wedge r) \equiv (p \to q) \wedge (p \to r)$

Answer: C

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11. Let R be an equivalence relation defined on a set containing 6 elements. The minimum number of ordered pairs that R should contain is

A. 6

B. 12

C. 36

D. 64

Answer: A

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12. The line joining $A(2, -7)$ dand $B(6, 5)$ is divided into 4 equal parts by the points P,Q and R such that $AQ = RP = QB$. The midpoint of PR is

A. $(-8, 1)$

B. $(4, 12)$

C. $(8, -2)$

D. $(4, -1)$

Answer: D

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13. Let $P \equiv (-1, 0), Q \equiv (0, 0)$ and $R \equiv (3, 3\sqrt{3})$ be three points. The equation of the bisector of the angle PQR is

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

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

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

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

Answer: C

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14. If m is the slope of one of the lines represented by $ax^2 + 2hxy + by^2 = 0$, then $(h + bm)^2$ =

A. $(a - b)^2$

B. $(a + b)^2$

C. $h^2 - ab$

D. $h^2 + ab$

Answer: C

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15.

$\cot 12^\circ \cot 102^\circ + \cot 102^\circ \cot 66^\circ + \cot 66^\circ \cot 12^\circ$

=

A. 1

B. -2

C. 2

D. -1

Answer: A

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16. $(\sin\theta + \cos\theta)(\tan\theta + \cot\theta) =$

A. 1

B. $\sin\theta.\ \cos\theta$

C. $\sec\theta.\ \mathrm{cosec}\theta$

D. $\sec\theta + \mathrm{cosec}\theta$

Answer: D

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17. The sides of a triangle are $6+\sqrt{12}$, $\sqrt{48}$ and $\sqrt{24}$. The tangent of the smallest angle of the triangle is

A. $\sqrt{2}-1$

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

C. 1

D. $\sqrt{3}$

Answer: B

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18. A simple graph contains 24 edges. Degree of each vertex is 3. The number of veretices is

A. 12

B. 8

C. 16

D. 21

Answer: B

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19. $\lim_{n \to \infty} \left\{ n \sin \frac{2\pi}{3n} . \cos \frac{2\pi}{3n} \right\} =$

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

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

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

D. 1

Answer: A

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20. The function $f(x) = [x]$, where $[x]$ denotes the greatest than x, is

A. continuous only at positive integral values of x

B. continuous for all non-integral values of x

C. continuous only at rational values of x

D. continuous for all real values of x

Answer: B

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21. If $a > b > 0, \sec^{-1}\left(\frac{a+b}{a-b}\right) = 2\sin^{-1}x,$

then x =

A. $\sqrt{\frac{b}{a+b}}$

B. $-\sqrt{\frac{b}{a+b}}$

C. $\sqrt{\frac{a}{a+b}}$

D. $-\sqrt{\frac{a}{a+b}}$

Answer: A

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22. If $x \neq n\pi, x \neq (2n+1)\frac{\pi}{2}, n \in$ then

$$\frac{\sin^{-1}(\cos x) + \cos^{-1}(\sin x)}{\tan^{-1}(\cot x) + \cot^{-1}(\tan x)}$$

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

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

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

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

Answer:

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23. The general solution of $1+\sin^2 x = 3\sin x.\cos x, \tan x \neq \frac{1}{2}$ is

A. $2n\pi - \frac{\pi}{4}, n \in Z$

B. $2n\pi + \frac{\pi}{4}, n \in Z$

C. $n\pi + \frac{\pi}{4}, n \in Z$

D. $n\pi - \frac{\pi}{4}, n \in Z$

Answer: C

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24. The least positive integer n, for which $\frac{(1+i)^n}{(1-i)^{n-2}}$ is positive is

A. 4

B. 3

C. 2

D. 1

Answer: B

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25. If $x + iy = \left(-1 + i\sqrt{3}\right)^{2010}$, then x=

A. 2^{2010}

B. -2^{2010}

C. -1

D. 1

Answer: A

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26. The greatest value of x satisfying $21 \equiv 385$ (mod x) and $587 \equiv 167$ (mod x) is

A. 32

B. 156

C. 56

D. 28

Answer: D

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27. The number $\left(49^2-4\right)\left(49^3-49\right)$ is divisible by

A. $9!$

B. $7!$

C. $5!$

D. $6!$

Answer: B

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28. The least positive integer x satisying $2^{2010} \equiv 3x$ (mod 5) is

A. 4

B. 3

C. 2

D. 1

Answer: B

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29. If A and B are two square matrices of the same order such that $AB = B$ and $BA = A$, then $A^2 + B^2$ is always equal to

A. $A + B$

B. I

C. $2BA$

D. $2AB$

Answer: A

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30. If A is a 3×3 nonsingular matrix and if $|A| = 3$, then $\left|(2A)^{-1}\right| =$

A. 3

B. 24

C. $\frac{1}{24}$

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

Answer: C

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31. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$ then $A^2 + xA + yI = 0$ for (x,y) =

A. $(-1, 3)$

B. $(-4, 1)$

C. $(1, 3)$

D. $(4, 1)$

Answer: B

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32. The constant term of the polynomial $\begin{vmatrix} x+3 & x & x+2 \\ x & x+1 & x-1 \\ x+2 & 2x & 3x+1 \end{vmatrix}$ is

A. 2

B. 0

C. 1

D. -1

Answer: D

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33. If $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ non zero coplanar vectors, then,

$$\left[2\overrightarrow{a} - \overrightarrow{b}\,3\overrightarrow{b} - \overrightarrow{c}\,4\overrightarrow{c} - \overrightarrow{a}\right] =$$

A. 0

B. 25

C. 9

D. 27

Answer: A

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34. A space vector makes the angle 150° and 60° with the positive direction of x and y-axes. The angle made by the vector with the positive direction of z-axis is :

A. 60°

B. 90°

C. 120°

D. 180°

Answer: B

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35. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0,$ then $3\vec{a}.\vec{b} + 2\vec{b}.\vec{c} + \vec{c}.\vec{a} =$

A. 1

B. -1

C. 3

D. -3

Answer: D

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36. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors along the positive direction of A,Y, and Z- axes, then a FALSE statement in the following is

A. $\Sigma \hat{i} \times \left(\hat{j} \times \hat{k}\right) = \overrightarrow{0}$

B. $\Sigma \hat{i} u \times \left(\hat{j} + \hat{k}\right) = \overrightarrow{0}$

C. $\Sigma \hat{i} \cdot \left(\hat{j} + \hat{k}\right) = \overrightarrow{0}$

D. $\Sigma \hat{i} \cdot \left(\hat{j} \times \hat{k}\right) = \overrightarrow{0}$

Answer: D

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37. In P(X), the power set of a nonempty set X, a binary operation* is defined by $A^* B = A \cup B \forall A, B \in P(X)$. Under * a TRUE statement is

A. inverse law is not satisfied

B. identity law is not satisfied

C. associative law is not satisfied

D. commutative law is not satisfied.

Answer: A

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38. The inverse of 2010 in the group Q^+ od all positive rationals under the binary operation * defined by $a * b = \frac{ab}{2010}, \forall a, b \in Q^+$, is

A. 2011

B. 2009

C. 2010

D. 1

Answer: C

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39. If the three functions $f(x)$, $g(x)$ and $h(x)$ are such that $h(x) = f(x).\, g(x)$ and $f'(x).\, g'(x) = c$, where c is a constant then $\frac{f''(x)}{f(x)} + \frac{g''(x)}{g(x)} + \frac{2c}{f(x) \cdot g(x)}$ is equal to

A. $\frac{h(x)}{h''(x)}$

B. $h'(x).\, h''(x)$

C. $\frac{h(x)}{h'(x)}$

D. $\frac{h''(x)}{h(x)}$

Answer: D

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40. The derivative of e^{ax} cosbx with respect to x is $re^{ax}\cos\left(bx+\frac{\tan^{-1}(b)}{a}\right)$. When $a>0, b>0$, the value of r is

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

B. $\sqrt{a^2+b^2}$

C. $a+b$

D. ab

Answer: B

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41. If

$$x = a\cos^3\theta \text{ and } y = a\sin^3\theta, \text{then } \frac{dy}{dx} =$$

A. $3\sqrt{\frac{x}{y}}$

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

C. $-3\sqrt{\frac{y}{x}}$

D. $-3\sqrt{\frac{x}{y}}$

Answer: C

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42. If $y = \tan^{-1}\sqrt{x^2 - 1}$, then the ratio $\frac{d^2y}{dx^2} : \frac{dy}{dx} =$

A. $\frac{1 - 2x^2}{x(x^2 - 1)}$

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

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

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

Answer: A

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43. P is the point of contact of the tangent from the origin to the curve $y = \log_e x$ The length of the perpendicular drawn from the origin to the normal at p is

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

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

C. $\sqrt{e^2 + 1}$

D. $2\sqrt{e^2 + 1}$

Answer: C

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44. For the curve $4x^5 = 5y^4$, the ratio of the cube of the suctangent at a point on the curve to the square of the subnormal at the same point is

A. $y\left(\frac{5}{4}\right)^4$

B. $x\left(\frac{4}{5}\right)^4$

C. $\left(\frac{5}{4}\right)^4$

D. $\left(\frac{4}{5}\right)^4$

Answer: D

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45. The set of real values of x for which $f(x) = \frac{x}{\log x}$ is increasing is

A. empty

B. $\{x : x \geq e\}$

C. $\{1\}$

D. $\{x : x < e\}$

Answer: B

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46. A wire of lenggth 20 cm is bent in the form of a sector of a circle. The maximum area that can be snclosed by the wire is

A. 25 sq. cm

B. 20 sq. cm

C. 30 sq. cm

D. 10 sq. cm

Answer: A

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47. Two circles centered at (2,3) and (5,6) intersect each other. If the radii are equal, the equation of the common chord is

A. $x - y + 1 = 0$

B. $x + y + 1 = 0$

C. $x - y - 8 = 0$

D. $x + y - 8 = 0$

Answer: D

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48. Equation of the circle centered at (4,3) touching the circle $x^2 + y^2 = 1$ externally, is

A. $x^2 + y^2 + 8x + 6y + 9 = 0$

B. $x^2 + y^2 - 8x - 6y + 9 = 0$

C. $x^2 + y^2 - 8x + 6y + 9 = 0$

D. $x^2 + y^2 + 8x - 6y + 9 = 0$

Answer: B

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49. The points $(1, 0), (0, 1), (0, 0)$ and $(2k, 3k), k \neq 0$ are concyclic if k =

A. $-\frac{1}{5}$

B. $\frac{1}{5}$

C. $\frac{5}{13}$

D. $\frac{-5}{13}$

Answer: D

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50. The locus of the point of intersection of the tangents drawn at the ends of a focal chord of the parabola $x^2 = -8y$ is

A. $x = -2$

B. $x = 2$

C. $y = -2$

D. $y = 2$

Answer: D

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51. The condition for the line $y = mx + c$ to be a normal to the parabola $y^2 = 4ax$ is

A. $c = -\frac{a}{m}$

B. $c = -2am - am^3$

C. $c = 2am + am^3$

D. $c = \frac{a}{m}$

Answer: B

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52. The eccentric angle of the point $(2, \sqrt{3})$ lying on $\frac{x^2}{16}+\frac{y^2}{4}=1$ is

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

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

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

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

Answer: D

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53. The distance of the focua of $x^2 - y^2 = 4$ from the directrix which is nearer to it, is

A. $7\sqrt{2}$

B. $4\sqrt{2}$

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: C

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54. If

$$f(x)\sin x.\cos x dx = \frac{1}{2(b^2 - a^2)}\log f(x) + c,$$

where c is the constant of integration, then

$f(x) =$

A. $\frac{2}{(b^2 - a^2)\cos 2x}$

B. $\frac{2}{ab\cos 2x}$

C. $\frac{2}{(b^2 - a^2)\sin 2x}$

D. $\frac{2}{\text{ab}\sin 2x}$

Answer: A

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55. If $\int \frac{\sqrt{x}}{x(x+1)} dx = k \tan^{-1} m$,then (k, m) is

A. $(1, x)$

B. $(2, x)$

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

D. $(1, \sqrt{x})$

Answer: C

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56. $\int_0^{\pi/4} \frac{\sin x + \cos x}{3 + \sin 2x} dx =$

A. $\log 3$

B. $\frac{1}{4}\log 3$

C. $2\log 3$

D. $\frac{1}{2}\log 3$

Answer: B

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57. $\int_0^3 x(1-x)^{3/2} dx =$

A. $\frac{4}{35}$

B. $\frac{-2}{35}$

C. $\frac{-8}{35}$

D. $\frac{24}{35}$

Answer: A

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58. The area bounded by the curve $y = \begin{cases} x^2, x < 0 \\ x, x \geq 0 \end{cases}$ and the line $y = 4$ is

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

B. $\frac{32}{8}$

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

D. $\frac{40}{3}$

Answer: B

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59. The order and degree of the differential equation $y = \frac{dp}{dx}x + \sqrt{a^2p^2 + b^2}$ where $p = \frac{a}{b}$

(here a and b are arbitrary constants) respectively are

A. $1, 1$

B. $2, 2$

C. $2, 1$

D. $1, 2$

Answer: B

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60. The general solution of the differential equation $2x\frac{dy}{dx} - y = 3$ is a family of

A. parabolas

B. hyperbolas

C. circles

D. straight lines

Answer: D

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