MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

KARNATAKA CET 2003

Mathematics

1. In Z the set of all integers, the inverse of -7 w.r.t. $' * '$ defined by $a * b = a + b + 7$ for all a, $b \in Z$ is

A. -14

B. 7

C. 14

D. -7

Answer: D

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2. Which of the following is a subgroup of $G = \{0, 1, 2, 3, 4, 5\}$ under addition modulo 6 ?

A. $\{0, 2\}$

B. $\{0, 1\}$

C. $\{0, 4\}$

D. $\{0, 3\}$

Answer: D

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3. In the three element group {e,a,b} where e is the identity , a^5b^4 is equal to

A. a

B. e

C. ab

D. b

Answer: A

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4. Which of the following is a group ?

A. {1,2,4,8} under multiplication

B. $\{0, \pm 2, \pm 4, \pm 6, \ldots\}$ under addition

C. $\{1, -1\}$ under addition

D. {0,1,2,3,4} under multiplication module 5

Answer: B

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5. If the circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other, then

A. $ff' = gg'$

B. $fg = f'g'$

C. $(fg)^2 = (f'g')^2$

D. $fg' = f'g$

Answer: D

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6. The relation $R = \{(1, 1), (2, 2), (3, 3)\}$ on the set {1,2,3} is

A. symmetric only

B. reflexive only

C. an equivalence relation

D. transitive only

Answer: C

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7. $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is

A. a tautology

B. a contradiction

C. both a tautology and a contradiction

D. neither a tautology nor a contradiction

Answer: B

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8. Which of the following is not a proposition?

A. 3 is a prime

B. $\sqrt{2}$ is irrational

C. Mathematics is interesting

D. 5 is an even integer

Answer: C

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9. Assuming that the sums and products given below are defined, which of the following is not true for matrices ?

A. AB=AC does not imply B=C

B. A+B=B+A

C. $(AB)' = B'A'$

D. AB=0 $\Rightarrow$ A=0 or B=0

Answer: A

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10. In a ΔABC if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix} = 0$ then

$\sin^2 A + \sin^2 B + \sin^2 C =$

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

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

C. $3\sqrt{3}$

D. 1

Answer: B

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11. 7th term of an A.P. is 40. then the sum of the first 13 terms is

A. 520

B. 53

C. 2080

D. 1040

Answer: A

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12. The number of words that can be formed out of the letters of the word "ARTICLE" so that the vowels occupy even places is

A. 574

B. 36

C. 754

D. 144

Answer: D

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13. The sum of the coefficients in the expansion of $\left(1+x-3x^2\right)^{3148}$

A. 8

B. 7

C. 1

D. -1

Answer: C

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14. The leat remainder when 17^{30} is divided by 5

A. 2

B. 1

C. 4

D. 3

Answer: C

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15. The coefficient of x^{32} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

A. ${}^{-15}C_3$

B. ${}^{15}C_4$

C. ${}^{-15}C_5$

D. ${}^{15}C_2$

Answer: B

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16. The line $3x - 2y = k$ meets the circle $x^2 + y^2 = 4r^2$ at only one point if $k^2 =$

A. $52r^2$

B. $20r^2$

C. $\frac{20}{9}r^2$

D. $\frac{52}{9}r^2$

Answer: A

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17. The limiting points of the coaxial system of circles $x^2 + y^2 + 2\lambda x + 4 = 0$ are

A. $(0, \pm 4)$

B. $(\pm 2, 0)$

C. $(0, \pm 1)$

D. $(0, \pm 2)$

Answer: B

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18. Which of the following is a point on the common chord of the circle

$x^2 + y^2 + 2x - 3y + 6 = 0$ and

$x^2 + y^2 + x - 8y - 13 = 0$?

A. $(1, 4)$

B. $(1, -2)$

C. $(1, -4)$

D. $(1, 2)$

Answer: C

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19. The directrix of the parabola $x^2 - 4x - 8y + 12 = 0$

A. y=0

B. x=1

C. $y = -1$

D. $x = -1$

Answer: C

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20. The locus of the point of intersection of the perpendicular tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is

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

B. $x^2 + y^2 = 9$

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

D. $x^2 + y^2 = 13$

Answer: D

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21. Inverse of the matrix of $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ is

A. $\frac{1}{10}\begin{pmatrix} 1 & -2 \\ 3 & 4 \end{pmatrix}$

B. $\frac{1}{10}\begin{pmatrix} 4 & 2 \\ -3 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 4 & 2 \\ -3 & 1 \end{pmatrix}$

D. $\frac{1}{10}\begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix}$

Answer: B

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22. $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2+b^2 & ab & a+b \end{vmatrix} =$

A. $\frac{1}{abc}(ab+bc+ca)$

B. $ab+bc+ca$

C. 0

D. a+b+c

Answer: C

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23. If the vectors $4\hat{i} + 11\hat{j} + m\hat{k}, 7\hat{i} + 2\hat{j} + 6\hat{k}$ and $\hat{i} + 5\hat{j} + 4\hat{k}$ are complanar then m=

A. 0

B. 38

C. -10

D. 10

Answer: D

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24. The angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ when $\vec{a} = (1, 1, 4)$ and $\vec{b} = (1, -1, 4)$ is

A. 45°

B. 90°

C. 15°

D. 30°

Answer: B

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25. If $\left|\vec{a} \times \vec{b}\right| = 4$ and $\left|\vec{a} \cdot \vec{b}\right| = 2$ then $\left|\vec{a}\right|^2\left|\vec{b}\right|^2 =$

A. 6

B. 2

C. 20

D. 8

Answer: C

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26. In a $\Delta ABCV$ if $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$

then cos C=

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

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

C. $\frac{16}{17}$

D. $\frac{17}{36}$

Answer: A

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27. $\cos 1^0 + \cos 2^0 + \cos 3^0 + \ldots + \cos 180^0 =$

A. 1

B. 0

C. 2

D. -1

Answer: D

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28. The value of $\frac{\tan 70^0 - \tan 20^0}{\tan 50^0} =$

A. 2

B. 1

C. 0

D. 3

Answer: A

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29. $\lim_{x \to 0} (1 - ax)^{\frac{1}{x}} =$

A. e^{-a}

B. e

C. e^{a}

D. 1

Answer: A

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30. $\lim_{n \to \infty} (3^n + 4^n)^{\frac{1}{n}} =$

A. 4

B. 3

C. e

D. ∞

Answer: A

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31. The locus of a point which moves such that the difference of its distances from two fixed points is always of its distances from two fixed points is always a constant is

A. a circle

B. a straight line

C. a hyperbola

D. an ellipse

Answer: C

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32. The distance between the directrices of the hyperbola $x = 8\sec\theta, y = 8\tan\theta$, is

A. $8\sqrt{2}$

B. $16\sqrt{2}$

C. $4\sqrt{2}$

D. $6\sqrt{2}$

Answer: A

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33. If $\cos^{-1} x + \cos y^{-1} + \cos^{-1} x = 3\pi$ then

$xy + yz + zx =$

A. 1

B. 0

C. -3

D. 3

Answer: D

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34. $\sin\left(\frac{1}{2}\cos^{-1}\frac{4}{5}\right) =$

A. $-\frac{1}{\sqrt{10}}$

B. $\frac{1}{\sqrt{10}}$

C. $-\frac{1}{10}$

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

Answer: B

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35. The general solution of the equation $\tan 2\theta \tan \theta = 1$ for $n \in Z$ is, $\theta =$

A. $(2n+1)\frac{\pi}{4}$

B. $(2n+1)\frac{\pi}{6}$

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

D. $(2n+1)\frac{\pi}{3}$

Answer: B

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36. The angle between the lines in $x^2 - xy - 6y^2 - 7x + 31y - 18 = 0$ is

A. 60°

B. 45°

C. 30°

D. 90°

Answer: B

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37. If p is the length of the perpendicular from the origin on the line whose intercepts on the axes are a and b, then

A. $p^2 = a^2 + b^2$

B. $p^2 = a^2 - b^2$

C. $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

D. $\frac{1}{p^2} = \frac{1}{a^2} - \frac{1}{b^2}$

Answer: C

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38. The equation of the line bisecting perpendicularly the segment joining the points $(-4, 6)$ and (8,8) is

A. y=7

B. 6x+y-19=0

C. x+2y-7=0

D. 6x+2y-19=0

Answer: B

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39. If the slope of one of the lines gives by $ax^2 + 2hxy + by^2 = 0$ is 5 times the other, then

A. $5h^2 = 9ab$

B. $5h^2 = ab$

C. $h^2 = ab$

D. $9h^2 = 5ab$

Answer: A

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40. The locus of a point which is equidistant from $(a+b, a-b)$ and $(a-b, a+b)$ is

A. ax+by=0

B. x-y=0

C. x+y=0

D. bx-ay=0

Answer: B

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41. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$

and hence evaluate the following:

(f) $\int_0^{\pi} \frac{xdx}{a^2\cos^2 x + b^2\sin^2 x}$

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

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

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

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

Answer: C

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42. $\int_0^{2\pi} (\sin x + |\sin x|)dx =$

A. 4

B. 0

C. 1

D. 8

Answer: A

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43. If $n \in N$ and $I_n = \int (\log x)^n \, dx$, then $I_n + nI_{n-1}$=

A. $(x \log x)^n$

B. $x(\log x)^n$

C. $n(\log x)^n$

D. $(\log x)^{n-1}$

Answer: B

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44. The area included between the parabolas $x^2 = 4y$ and $y^2 = 4x$ is, (in square units)

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

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

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

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

Answer: C

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45. The differential equation for which $\sin^{-1} x + \sin^{-1} y = C$ is given by

A. $\sqrt{1-x}^2 dy + \sqrt{1-y^2} dx = 0$

B. $\sqrt{1-x^2} dx + \sqrt{1-y^2} dy = 0$

C. $\sqrt{1-x^2} dx - \sqrt{1-y^2} dy = 0$

D. $\sqrt{1-x^2} dy - \sqrt{1-y^2} dx = 0$

Answer: A

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46. The derivative of $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ w.r.t. $\cot^{-1}\left(\frac{1-3x^2}{3x-x^3}\right)$ is

A. $3/2$

B. 1

C. $1/2$

D. $2/3$

Answer: D

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47. If $x = a(\theta - \sin\theta), y = a(1 - \cos\theta)$ then $\frac{dy}{dx} =$

A. $\cot\frac{\theta}{2}$

B. $\tan\frac{\theta}{2}$

C. $\frac{1}{2}\text{cosec}^2\frac{\theta}{2}$

D. $-\frac{1}{2}\text{cosec}^2\frac{\theta}{2}$

Answer: A

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48. If $y = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} - \ldots .$ then $\frac{d^2y}{dx^2} =$

A. $-x$

B. x

C. y

D. $-y$

Answer: C

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49. The slope of the tangent to the curve $x = 3t^2 + 1, y = t^3 - 1$ at x=1 is

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

B. 0

C. -2

D. ∞

Answer: B

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50. For the curve $xy = c^2$ the subnormal at any point varies as

A. x^3

B. x^2

C. y^3

D. y^2

Answer: C

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

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

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

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

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

Answer: D

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52. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 2\cos\theta$ then $x^6 + x^{-6} =$

A. $2\cos 12\theta$

B. $2\cos 6\theta$

C. $2\sin 3\theta$

D. $2\cos 3\theta$

Answer: A

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53. Which of the following is a fourth root of $\frac{1}{2} + i\frac{\sqrt{3}}{2}$?

A. $cis\frac{\pi}{12}$

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

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

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

Answer: A

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54. The function $f(x) = |x| + \frac{|x|}{x}$ is

A. discontinuous at the origin because |x| is discontinuous there

B. continuous at the origin

C. discontinuous at the origin because both |x| and $\frac{|x|}{x}$ are discontinuous there

D. discontinuous at the origin because $\frac{|x|}{x}$ is discontinuous there

Answer: D

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55. If

$f(a) = 2, f'(a) = 1, g(a) = -3, g'(a) = -1$

then $\lim_{x \to a} \frac{f(a)g(x) - f(x)g(a)}{x - a} =$

A. 6

B. 1

C. -1

D. -5

Answer: B

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56. The maximum of $4\sin^2 x + 3\cos^2 x$ is

A. 4

B. 3

C. 7

D. 5

Answer: A

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57. The rate of change of the surface area of a sphere of radius r when the radius is increasing at the rate of 2cm/sec is proportional to

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

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

C. r^2

D. r

Answer: D

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58. $\int \sqrt{1+\sin\frac{x}{4}}dx =$

A. $8\left(\sin\frac{x}{8}+\cos\frac{x}{8}\right)+C$

B. $8\left(\sin\frac{x}{8}-\cos\frac{x}{8}\right)+C$

C. $8\left(\cos\frac{x}{8}-\sin\frac{x}{8}\right)+C$

D. $\frac{1}{8}\left(\sin\frac{x}{8}-\cos\frac{x}{8}\right)+C$

Answer: B

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59. $\int e^x \left(\frac{1+\sin x}{1+\cos x} \right) dx =$

A. $e^x \sec^2 \frac{x}{2} + C$

B. $e^x \tan \frac{x}{2} + C$

C. $e^x \sec \frac{x}{2} + C$

D. $e^x \tan x + C$

Answer: B

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60. $\int_0^{\infty} \frac{xdx}{(1+x)(1+x^2)} =$

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

B. 0

C. 1

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

Answer: D

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