MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

KARNATAKA CET 2013

Mathematics

1. If A and B are square matrices of the same order such that $(A+B)(A-B)=A^2-B^2$, then $(ABA)^2=$

A. Either of A or B is zero matrix

B. A=B

C. AB=BA

D. Either of A or B is an identity matrix

Answer: C

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2. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$ then $\alpha =$

A. ± 1

B. ± 2

C. ± 3

D. ± 5

Answer: C

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3. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$, then $\frac{dA}{dx} =$

A. $3B + 1$

B. 3B

C. $-3B$

D. $1-3B$

Answer: B

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4. If the determinant of the adjoint of a (real) matrix of order 3 is 25, then the determinant of the inverse of the matrix is

A. 0.2

B. ± 5

C. $\frac{10}{\sqrt[5]{625}}$

D. ± 0.2

Answer: D

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5. If the matrix $\begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix} = A + B$, where A is symmetric and B is skew symmetric, then B=

A. $\begin{bmatrix} 2 & 4 \\ 4 & -1 \end{bmatrix}$

B. $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

Answer: D

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6. In a group $(G, *)$ for some element a of G , $a^2 = e,$ where e is the indentity element . Then

A. $a = a^{-1}$

B. $a = \sqrt{e}$

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

D. $a = e$

Answer: A

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7. In the group (Z,*) if $a * b = a + b - n \forall a, b \in Z$, where n is a fixed integer, then the inverse of $(-n)$ is

A. n

B. $-n$

C. $-3n$

D. $3n$

Answer: D

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8. If $\vec{a} = (1, 2, 3),\ \vec{b} = (2, -1, 1),\ \vec{c} = (3, 2, 1)$ and $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \alpha$

, then

A. $\alpha = 1, \beta = 10, \gamma = 3$

B. $\alpha = 0, \beta = 10, \gamma = -3$

C. $\alpha + \beta + \gamma = 8$

D. $\alpha = \beta = \gamma = 0$

Answer: B

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9. If $\vec{a} \perp \vec{b}$ and $\left(\vec{a} + \vec{b}\right) \perp \left(\vec{a} + m\vec{b}\right)$, then m=

A. -1

B. 1

C. $\frac{-\left|\vec{a}\right|^2}{\left|\vec{b}\right|^2}$

D. 0

Answer: C

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

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

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

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

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

Answer: B

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11. If $\vec{a}$ is vector perpendicular to both $\vec{b}$ and $\vec{c}$, then

A. $\vec{a}.\left(\vec{b}\times\vec{c}\right)=0$

B. $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\vec{0}$

C. $\vec{a}\times\left(\vec{b}+\vec{c}\right)=\vec{0}$

D. $\vec{a}+\left(\vec{b}+\vec{c}\right)=\vec{0}$

Answer: B

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12. A tangent is drawn to the circle $2x^2+2y^2-3x+4y=0$ at the point 'A' and it meets the line $x+y=3$ at B(2,1) then AB=

A. $\sqrt{10}$

B. 2

C. $2\sqrt{2}$

D. 0

Answer: B

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13. The area of the circle having its centre at (3,4) and touching the line $5x + 12y - 11 = 0$ is

A. 16π sq.units

B. 4π sq.units

C. 12π sq.units

D. 25π sq.units

Answer: A

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14. The number of real circles culting orthogonally the circle $x^2 + y^2 + 2x - 2y + 7 = 0$ is

A. 0

B. 1

C. 2

D. infinitely many

Answer: A

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15. The length of the chord of the circle $x^2 + y^2 + 3x + 2y - 8 = 0$ intercepted by the y-axis is

A. 3

B. 8

C. 9

D. 6

Answer: D

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16. $A \equiv (\cos\theta, \sin\theta), B \equiv (\sin\theta, -\cos\theta)$ are two points. The locus of the centroid of ΔOAB, where 'O' is the origin is

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

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

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

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

Answer: B

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17. The sum of the squares of the eccentricities of the conics $\frac{x^2}{4} + \frac{y^2}{3} = 1$ and $\frac{x^2}{4} - \frac{y^2}{3} = 1$ is

A. 2

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

C. $\sqrt{7}$

D. $\sqrt{3}$

Answer: A

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18. The equation of the tangent to the parabola $y^2 = 4x$ inclined at an angle of $\frac{\pi}{4}$ to the postive direction of x-axis is

A. $x + y - 4 = 0$

B. $x - y + 4 = 0$

C. $x - y - 1 = 0$

D. $x - y + 1 = 0$

Answer: D

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19. If the distance between the foci and the distance between the directrices of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are in the ratio $3:2$ then $a:b$ is

A. $\sqrt{2}:1$

B. $1:2$

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

D. $2:1$

Answer: A

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20. If the area of the auxilliary circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1(a > b)$ is twice the area of the ellipse, then the eccentricity of the ellipse is

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

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

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

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

Answer: D

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21. $\cos\left[2\cos^{-1}\frac{1}{5}+\sin^{-1}\frac{1}{5}\right]=$

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

B. $\frac{-2\sqrt{6}}{5}$

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

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

Answer: B

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22. $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$ is

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

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

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

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

Answer: A

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23. The general solution of $\sin x - \cos x = \sqrt{2}$, for any integer 'n' is

A. $2n\pi + \frac{3\pi}{4}$

B. $n\pi$

C. $(2n+1)\pi$

D. $2n\pi$

Answer: A

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24. The modulus and amplitude of $\frac{1+2i}{1-(1-i)^2}$ are

A. $\sqrt{2}$ and $\frac{\pi}{6}$

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

C. 1 and 0

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

Answer: C

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25. If $2x = -1+\sqrt{3}i$, then the value of $\left(1-x^2+x\right)^6 - \left(1-x+x^2\right)^6 =$

A. 32

B. 64

C. -64

D. 0

Answer: D

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26. If $x + y = \tan^{-1} y$ and $\frac{d^2y}{dx^2} = f(y)\frac{dy}{dx}$, then f(y) =

A. $\frac{-2}{y^3}$

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

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

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

Answer: B

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27. $f(x) = \begin{cases} 2a - x, \text{when} a < x < a \\ 3x - 2a, \text{when } \ a \leq x \end{cases}$. Then which of the following is true?

A. f(x) is not differentiable at x=a

B. f(x) is discondtinuous at x =a

C. f(x) is continuous for all $x < a$

D. f(x) is differentiable for all $x \geq a$

Answer: A

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28. Let $f(x) = \cos^{-1}\left[\frac{1}{\sqrt{13}}(2\cos x - 3\sin x)\right]$. Then f(0.5) =

A. 0.5

B. 1

C. 0

D. -1

Answer: B

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29. If f (x) is a function such that $f''(x) + f(x) = 0$ and $g(x) = [f(x)]^2 + [f'(x)]^2$ and $g(3) = 3$ then $g(8) =$

A. 0

B. 3

C. 5

D. 8

Answer: D

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30. If $f(x) = f'(x) + f''(x) + f'''(x) + \ldots$ and $f(0) = 1$, then f(x) =

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

B. e^{x}

C. e^{2x}

D. e^{4x}

Answer: A

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31. The function $f(x) = \frac{x}{3} + \frac{3}{x}$ decreases in the interval

A. $(-3, 3)$

B. $(-\infty, 3)$

C. $(3, \infty)$

D. $(-9, 9)$

Answer: A

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32. If $\sin^{-1} a$ is the acture angle between the curves $x^2 + y^2 = 4x$ and $x^2 + y^2 = 8$ at (2,2), then a=

A. 1

B. 0

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

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

Answer: C

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33. The maximum area of a rectangle that can be inscribed in a circle of radisu 2 units is

A. 8π sq.units

B. 4 sq.units

C. 5 sq.units

D. 8 sq.units

Answer: D

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34. If the length of the sub-tanget at any point to the curve $xy^n = a$ is proportional to the abscissa, then 'n' is

A. any non-zero real number

B. 2

C. -2

D. 1

Answer: A

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35. $\int \frac{\cos^{n-1} x}{\sin^{n+1} x} dx, n \neq 0$ is

A. $\frac{\cot^n x}{n} + C$

B. $\frac{-\cot^{n-1} x}{n-1} + C$

C. $\frac{-\cot^n x}{n} + C$

D. $\frac{\cot^{n-1} x}{n-1} + C$

Answer: C

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36. $\int \frac{(x-1)e^x}{(x+1)^3} dx =$

A. $\frac{e^x}{x+1} + C$

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

C. $\frac{e^x}{(x+1)^3} + C$

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

Answer: B

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37. If $I_1 = \int_0^{\pi/2} x.\sin x dx$ and $I_{20} = \int_0^{\pi/2} x.\cos x dx$ then which one of the following is true?

A. $I_1 = I_2$

B. $I_1 + I_2 = 0$

C. $I_1 = \frac{\pi}{2}.I_2$

D. $I_1 + I_2 = \frac{\pi}{2}$

Answer: D

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38. The value of $\int_{-1}^{2} \frac{|x|}{x} dx$ is

A. 0

B. 1

C. 2

D. 3

Answer: B

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39. $\int_{0}^{\pi} \frac{\cos^4 x}{\cos^4 x + \sin^4 x} dx =$

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

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

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

D. π

Answer: B

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40. The area bounded by the curve $y = \sin\left(\frac{x}{3}\right)$, x-axis and lines x=0 and $x = 3\pi$ is

A. 9

B. 0

C. 6

D. 3

Answer: C

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41. The general solution of the differential equation $\sqrt{1-x^2y^2}.\,dx = y.\,dx + x.\,dy$ is

A. $\sin(xy) = x + c$

B. $\sin^{-1}(xy) + x = c$

C. $\sin(x + c) = xy$

D. $\sin(xy) + x = c$

Answer: C

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42. If 'm' and 'n' are the order and degree of the differential equation $(y'')^5 + 4.\dfrac{(y'')^3}{y'''} + y''' = \sin x$, then

A. m=3,n=5

B. m=3,n=1

C. m=3,n=3

D. m=3,n=2

Answer: D

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43. If $\frac{(x+1)^2}{x^3+x} = \frac{A}{x} + \frac{Bx+C}{x^2+1}$, then $\sin^{01} A + \tan^{-1} B + \sec^{-1} C =$

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

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

C. 0

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

Answer: D

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44. The sum of the series, $\frac{1}{2.3}.2+\frac{2}{3.4}.2^2+\frac{3}{4.5}.2^3+$ ....to n terms is

A. $\frac{2^{n+1}}{n+2}+1$

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

C. $\frac{2^{n+1}}{n+2}+2$

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

Answer: B

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45. If the roots of the equation $x^3+ax^2+bx+c=0$ are in A.P., $2a^3-9ab$=

A. 9c

B. 18c

C. 27c

D. $-27c$

Answer: D

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46. If the value of $C_0 + 2C_1 + 3C_2 + \ldots\ldots + (n+1)C_n = 576$ then n is :

A. 7

B. 5

C. 6

D. 9

Answer: A

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47. The inverse of the proposition $(p \wedge \sim q) \rightarrow r$ is

A. $(\sim r) \rightarrow (\sim p) \vee q$

B. $(\sim p) \vee q \rightarrow (\sim r)$

C. $r \rightarrow p \wedge (\sim q)$

D. $(\sim p) \vee (\sim q) \rightarrow r$

Answer: B

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48. The range of the function $f(x) = \sin[x], -\frac{x}{4} < x < \frac{x}{4}$ where [x] denotes the greatest integer $\leq x$, is

A. [0]

B. $[0, -1]$

C. $[0, \pm \sin 1]$

D. $[0, -\sin 1]$

Answer: A

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49. If the line $6x - 7y + 8 + \lambda(3x - y + 5) = 0$ is parallel to y-axis, then $\lambda =$

A. -7

B. -2

C. 7

D. 2

Answer: A

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50. The angle between the lines $\sin^2\alpha . y^2 - 2xy . \cos^2\alpha + (\cos^2\alpha - 1)x^2 = 0$ is

A. 90°

B. α

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

D. 2α

Answer: A

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51. The minimum area of the triangle formed by the variable line $3\cos\theta.\, x + 4\sin\theta.\, y = 12$ and the co-ordinate axes is

A. 144

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

C. $\frac{49}{4}$

D. 12

Answer: D

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52. $\log(\sin 1^\circ) \times \log(\sin 2^\circ) \times \log(\sin 3^\circ) \ldots\ldots \log(\sin 179^\circ)$

A. is positive

B. is negative

C. lies between 1 and 180

D. is zero

Answer: D

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53. If $\sin x + \sin y = \frac{1}{2}$ and $\cos x + \cos y = 1$, then $\tan(x + y) =$

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

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

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

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

Answer: C

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54. In a triangle ABC, if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ and $a = 2$ then its area is

A. $2\sqrt{3}$

B. $\sqrt{3}$

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

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

Answer: B

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55. $\lim_{x \to 0} \frac{\log_e(1+x)}{3^x - 1} =$

A. $\log_e 3$

B. 0

C. $\log_3 e$

D. 1

Answer: C

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56. Let $f(x) = \begin{cases} x, \text{ if x is irrational} \\ 0, \text{ if x is ratinal} \end{cases}$ then f is

A. continuous everywhere

B. discontinuous everywhere

C. continuous only at x= 0

D. continuous at all rational numbers

Answer: C

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57. In a regular graph of 15 vertices the sum of the degree of the vertices is 60. Then the degree of each vertex is

A. 5

B. 3

C. 4

D. 2

Answer: C

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58. The remainder when, $10^{10}.\left(10^{10}+1\right)\left(10^{10}+2\right)$ is divided by 6 is

A. 2

B. 4

C. 0

D. 6

Answer: C

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59. A value of x satisfying $150x \equiv 35 \pmod{31}$ is

A. 14

B. 22

C. 24

D. 12

Answer: C

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60. The smallest positive divisor greater than 1 of a composite number 'a' is

A. $< \sqrt{a}$

B. $= \sqrt{a}$

C. $> \sqrt{a}$

D. $\leq \sqrt{a}$

Answer: D

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