MATHS

BOOKS - GURUKUL BOOKS & PACKAGING MATHS (HINGLISH)

MARCH 2018

Section I

1. Select and write the most appropriate answer from the given alternatives in each of the following :

If $A = \begin{pmatrix} 2 & -3 \\ 4 & 1 \end{pmatrix}$, then adjoint of matrix A is

A. $\begin{bmatrix} 1 & 3 \\ -4 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -3 \\ -4 & 2 \end{bmatrix}$

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

D. $\begin{bmatrix} -1 & -3 \\ -4 & 2 \end{bmatrix}$

Answer: A

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2. Find the principal value of $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$

A. $\frac{\pi}{3}, \frac{11\pi}{6}$

B. $\frac{\pi}{6}, \frac{11\pi}{6}$

C. $\frac{\pi}{6}, \frac{11\pi}{4}$

D. $\frac{\pi}{6}, \frac{11\pi}{4}$

Answer: B

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3. The measure of acute angle between the lines whose direction ratios are $3, 2, 6$ and -2, -1, 2` is

A. $\cos^{-1}\left(\frac{1}{7}\right)$

B. $\cos^{-1}\left(\frac{8}{15}\right)$

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

D. $\cos^{-1}\left(\frac{8}{21}\right)$

Answer: D

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4. Write the negations of the following statements :

(a) All students of this college live in the hostel .

(b) 6 is an even number or 36 is a perfect square.

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5. If a line makes angles α, β, γ with the coordinate axes, prove that $\cos 2\alpha + \cos 2\beta + \cos 2\gamma + 1 = 0.$

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6. Find the distance of the point $(1, 2 - 1)$ from the plane $x - 2y + 4z - 10 = 0.$

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7. Find the vector equation of the line which passes through the point with position vector $4\hat{i} - \hat{j} + 2\hat{k}$ and is in the direction of $-2\hat{i} + \hat{j} + \hat{k}.$

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8. If $\bar{a} = 3\hat{i} - 2\hat{j} + 7\hat{k}, \bar{b} = 5\hat{i} + \hat{j} - 2\hat{k}$ and $\bar{c} = \hat{i} + \hat{j} - \hat{k},$ then find $\bar{a} \cdot (\bar{b}$

.

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9. Prove using vectors: Medians of a triangle are concurrent.

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10. Using the truth table, prove the following logical equivalence :

$p \Leftrightarrow q \equiv (p \wedge q) \vee (\sim p \wedge \sim q)$.

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11. If the origin is the centroid of the triangle whose vertices are A (2,p,-3), B(q,-2,5) and C(-5,1,r), then find the values of p,q and r.

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12. Show that a homogeneous equations of degree two in x and y , i.e., $ax^2 + 2hxy + by^2 = 0$ represents a pair of lines passing through the origin if $h^2 - 2ab \geq 0$.

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13. In $\triangle ABC$, prove that $\tan\left(\frac{C-A}{2}\right) = \left(\frac{c-a}{c+a}\right)\frac{\cot(B)}{2}$.

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14. Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ by using elementary row transformations.

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15. Find the joint equation of the pair of lines through the origin which are perpendicular to the lines given by $5x^2 + 2xy - 3y^2 = 0$.

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16. Find the angle between the pair of lines

$\frac{x-1}{4} = \frac{y-3}{1} = \frac{z}{8}$ and $\frac{x-2}{2} = \frac{y+1}{2} = \frac{z-4}{1}$.

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17. Write converse, inverse and contrapositive of the following conditional statement :

"If an angle is a right angle, then its measure is 90°".

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18. Prove the following: $\cos^{-1}\left(\frac{12}{13}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \sin^{-1}\left(\frac{56}{65}\right)$

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19. Find the vector equation of the plane passing through the point $A(1, 0, 1), B(1, -1, 1)$ and $C(4, -3, 2)$

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20. Minimize $z = 7x + y$, subject to

$5x + y \geq 5, x + y \geq 3, x \geq 0, y \geq 0.$

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Section Ii

1. Let the p.m.f. of a random variable X be -

$P(x) = \frac{3 - x}{10}$ for $x = -1, 0, 1, 2$

= 0 otherwise

Then E(X) is ..... .

A. 1

B. 2

C. 0

D. -1

Answer: C

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2. if $\int_0^k \frac{dx}{2+8x^2} = \frac{\pi}{16}$ then find the value of k

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

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

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

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

Answer: A

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3. Integrating factor of linear differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$ is

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

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

C. x

D. x^2

Answer: D

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4. Evaluate : $\int e^x \left[\frac{\cos x - \sin x}{\sin^2 x}\right] dx.$

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5. if $y = \tan^2\left(\log x^3\right)$, find $\frac{dy}{dx}$.

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6. Find the area of ellipse $\frac{x^2}{1} + \frac{y^2}{4} = 1$.

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7. Obtain the differential equation by eliminating the arbitrary constants from the following equation :

$y = c_1 e^{2x} + c_2 e^{-2x}$.

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8. Given X~ B (n,P)

If n= 10 and p=0.4 , find E(X) and Var (X) .

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9. Evaluate : $\int \frac{1}{3+2\sin x+\cos x}dx.$

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10. If $x = a\cos^3 t, y = a\sin^3 t$, show that $\frac{dy}{dx} = -\left(\frac{y}{x}\right)^{\frac{1}{3}}$

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11. Examine the contionuity of the following functions at the give points

$f(x) = \begin{cases} \frac{\log 100 + \log(0.01 + x)}{3x} & \text{for } x \neq 0 \text{ and } \frac{100}{3} \text{ for x =0 } \end{cases}$ at $x = 0$

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12. Find all the points of local maxima and minima and the corresponding maximum and minimum values of the function

$f(x) = 2x^3 - 21x^2 + 36x - 20.$

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13. Prove that : $\int \frac{1}{a^2 - x^2} dx = \frac{1}{2a} \log \left| \frac{a + x}{a - x} \right| + c.$

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14. $\int_{-a}^{a} f(x) dx = 2 \int_{0}^{a} f(x) dx,$ if f is an even function

0, if f is an odd function.

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15. If $f(x) \frac{x^2 - 9}{x - 3} + \alpha, \text{for} x > 3$

$= 5, \text{for} x = 3$

$= 2x^2 + 3x + \beta, \text{for} x < 3$

is continous at $x = 3,$ find α and $\beta.$

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16. $\tan^{-1}\left(\frac{5x+1}{3-x-6x^2}\right)$

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17. A fair coin is tossed 8 times. Find the probability that it shows heads

(i) exactly 5 times (March ' 17)

(2) at lest once . (March ' 14- 17)

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18. Verify Rolle's theorem for the following function : $f(x) = x^2 - 4x + 10$ on $[0, 4]$

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19. Find the particular solutions of the following differential equation :

(1) $y(1+\log x)\dfrac{dx}{dy} - x\log x = 0, when, x = e, y = e^2$

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20. Find the variance and standard deviation of the random variable X whose probability distribution is given below :

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

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