MATHS

BOOKS - ACCURATE PUBLICATION

SAMPLE QUESTIONS PAPER - III (UNSOLVED)

Section A

1. Let A = {1, 2, 3}. Then number of relations containing (1, 2) and (1, 3) which are reflexive and symmetric but not transitive is

A. 1

B. 2

C. 3

D. 40

Answer: A

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2. The value of $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is

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

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

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

D. 1

Answer: D

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3. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then verify that $A'A = I$

A. I

B. 2I

C. 3I

D. 0

Answer: A

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4. Show that if $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$

A. 0

B. 1

C. 2

D. 3

Answer: B

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5. If A_{ij} is the co-factor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then write the value of a_{32}, A_{32}

A. 100

B. 105

C. 110

D. 115

Answer: C

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6. The value of the constant k so that the function $f(x) = \begin{cases} \frac{x^2-3x+2}{x-1} & , \text{ if } x \neq 1 \\ k & , \text{ if } x = 1 \end{cases}$ is continuous at x = 1 is

A. 0

B. 1

C. 2

D. -1

Answer: D

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7. The derivative of $f(x) = |x|$ at $x = 1$ equals

A. 1

B. -1

C. 0

D. 2

Answer: A

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8. The derivative of $\left(3x^2 - 9x + 5\right)^9$ w.r.t x is

A. $(6x - 9)\left(3x^2 - 9x + 5\right)^8$

B. $3(6x - 9)\left(3x^2 - 9x + 5\right)^8$

C. $\left(6(6x - 9)\left(3x^2 - 9x + 5\right)^8\right.$

D. $9(6x - 9)\left(3x^2 - 9x + 5\right)^8$

Answer: D

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9. $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$ is equal to :

A. tan x + cot x + c

B. tan x + cosec + c

C. $-\tan x + \cot x + C$

D. tan x + sec x + C

Answer: A

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10. $\int_0^{\frac{\pi}{2}} \cos^2 dx$ is

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

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

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

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

Answer: A

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11. The number of arbitrary constants in the particular solution of a differential equation of 'third order are-:

A. 3

B. 2

C. 1

D. 0

Answer: D

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12. Solution of $\frac{dy}{dx} = \frac{x}{y}(y \neq 0)$ is

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

B. $x^2 - y^2 = c$

C. $3x^2 + y^2 = c$

D. $4x^2 + y^2 = c$

Answer: B

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13. If $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} = \lambda\hat{j} + 3\hat{k}$, then the value of λ so that $\vec{a} + \vec{b}$ is perpendicular to $\vec{a} - \vec{b}$ is

A. $\pm\sqrt{21}$

B. $\pm 2\sqrt{22}$

C. $\pm 2\sqrt{21}$

D. $\sqrt{15}$

Answer: C

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14. If $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 5$ and $\vec{a}.Vec(b) = 8$, then $\left|\vec{a} - \vec{b}\right|$ is

A. $\sqrt{10}$

B. $\sqrt{11}$

C. $\sqrt{13}$

D. $\sqrt{15}$

Answer: C

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15. Distance between plane defined by $3x + 4y + 5 = 0$ and the point (5, 0, 7) is

A. 3 units

B. 4 units

C. 5 units

D. 6 units

Answer: B

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16. If $P(A) = \frac{7}{13}, P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$. then `P(A/B) is equal to :

A. $\frac{2}{9}$

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

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

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

Answer: B

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17. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

not onto

Let $f: R \to R$ be defined as f(x) = 5. Then f is one one .....

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18. The value of x, so that the matrix A = $\begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ is a skew - symmetric matrix is .....

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19. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

$\frac{d}{dx}\left[3x^2-9x+5\right]^9$ = ...

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20. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

The maximum profit that a company can make, if the profit function is given by p(x) = 41 + 24x - $18x^2$ is .....

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21. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

$\int \frac{\log(\sin x)}{\tan x} dx$ = ...

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22. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

The I.F. of x $\frac{dy}{dx} - y - 2x^2 = 0$ is .....

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23. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

$\int \frac{\log(\sin x)}{\tan x} dx$ = ...

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24. Fill in the blanks from the given options :

$\frac{1}{2}, 9(6x-9)\left(3x^2-9x+5\right)^8, 49, \ -2, \frac{1}{2}[\log(\sin x)]^2+c, \frac{1}{x}, 10,$

onto

$\frac{d}{dx}\left[3x^2 - 9x + 5\right]^9$ = ...

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25. State true or false for the following statements :

$\sin^{-1} x = (\sin x)^{-1}$

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26. State true or false for the following statements :

$\left(A^{-1}\right)' = (A')^{-1}$

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27. State true or false for the following statements :

$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v}$

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28. State true or false for the following statements :

$$\int \frac{\sin^2 x}{1-\cos x} dx = x + \sin x + c.$$

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29. State true or flase for the following statements :

The value of λ if $\left(2\hat{i} + 6\hat{j} + 14\hat{k}\right)\left(\hat{i} - \lambda\hat{j} + 7\hat{k}\right) = \overrightarrow{0}$ is - 2.

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30. State true or flase for the following statements :

A unit normal vector to the plane $x + 2y + 3z - 6 = 0$ is $\frac{1}{\sqrt{14}}\hat{i} + \frac{2}{\sqrt{14}}\hat{j} + \frac{3}{\sqrt{14}}\hat{k}$.

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31. State true or false for the following statements :

A random variable X has the following probability distrubution :

X	0	1	2	3	4	5	6	7
P(X)	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Then k is $\frac{1}{5}$.

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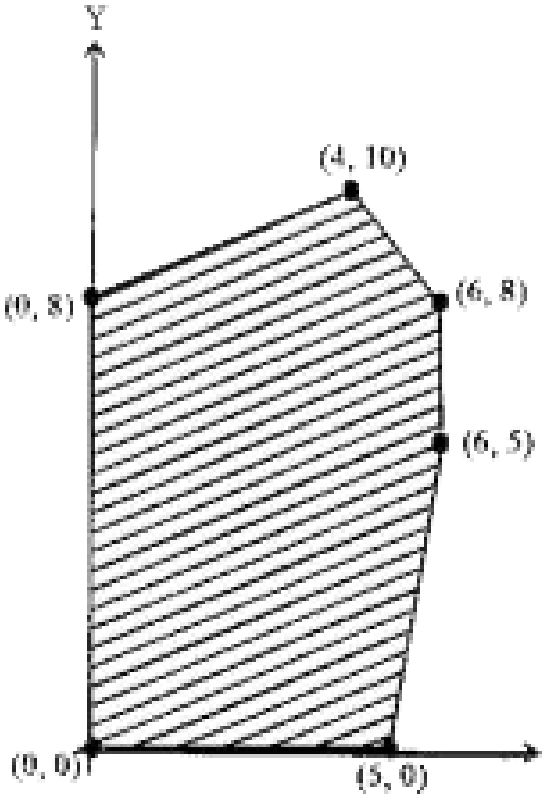
32. The feasible solution for a LPP is shown in Fig. Let. Z = 3x-4 y be the objective function. Maximum of Z occurs at:



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Section B

1. If matrix $A = [a_ij]_3 \times 2$ and $a_ij = (3i - 2j)^2$, then find matrix A.

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2. If $A = \begin{bmatrix} 4 & 1 & 1 \\ 1 & 4 & 1 \\ 1 & 1 & 4 \end{bmatrix}$, then show that $|2A| = 8|A|$.

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3. Show that the equation of the tangent to the parabola $y^2 = 4ax$ at (x_1, y_1) is $yy_1 = 2a(x + x_1)$.

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4. Show that y = log (1 + x) - $\frac{2x}{2 + x}$ is strictly increasing funtion of x for all values of $x > -1$.

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5. Find $\int \frac{4 - 5\sin x}{\cos^2 x} dx.$

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6. Find the area bounded between the curve $y^2 = x$ and the line x=3.

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7. A vector $\overrightarrow{r}$ is inclined at equal angles to the three axes. If the magnitude of $\overrightarrow{r}$ is $2\sqrt{3}$ units, find $\overrightarrow{r}$.

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8. If A,B,C,D are the points with positon vectors $\hat{i} + \hat{j} - \hat{k}, 2\hat{i} - \hat{j} + 3\hat{k}, 2\hat{i} - 3\hat{k}, 3\hat{i} - 2\hat{j} + htk$, respectively find the

projection of $\overrightarrow{AB}$ along $\overrightarrow{CD}$.

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Section C

1. Solve the equation $\tan^{-1}\sqrt{x^2+x+\sin^{-1}}\sqrt{x^2+x+1}=\frac{\pi}{2}$.

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2. Prove that $\cot^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right]=\frac{x}{2}, x\in\left(0,\frac{\pi}{4}\right)$

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3. If $\left(x^2+y^2\right)^2=xy$ find $\frac{dy}{dx}$

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4. Evaluate : $\int \sin^{-1}\left(\sqrt{\frac{x}{a+x}}\right) dx$

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5. Evalute : $\int \frac{5x+3}{\sqrt{x^2+4x+10}} dx$

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6. Find IF $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x.$

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7. A committee of 4 students is selected at random from a group consisting 8 boys and 4 girls. Given that there is at least one girl in the committee, calculate the probability that there are exactly 2 girls in the committee.

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8. Bag A contains 3 red and 2 black balls, while bag B contains 2 red and 3 black balls. A ball drawn at random from bag A is transferred to bag B and one ball is drawn at randon from bag B. If this ball was found to be red ball, find the probability that the ball drawn from bag A was red.

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Section D

1. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}, B = \begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}$, find AB Also solve $x - 2y = 10, 2x + y + 3z = 8, -2y + z = 7$

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2. Using properties of determinants, show that:

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

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3. Find the image of the point (1,6,3) in the line : $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.

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4. Find the shortest distance between the lines l_1 and l_2 whose vector equaitons are

$\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} - \mu\left(3\hat{i} - 5\hat{j} + 3\hat{k}\right)$

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5. Solve the following linear programming problem graphically :

Maximum Z = 34 x + 45 y

subject to the constraints

$x + y \leq 300$

$2x + 3y \leq 70$

$x \geq 0, y \geq 0$

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6. Solve the following linear programming problem graphically:

Miximise $Z = x + 2y$ subject to the constraints :

$x + 2y \geq 100$

$2x - y \leq 0$

$2x + y \leq 200$

$x \geq 0, y \geq 0$

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