MATHS

BOOKS - ACCURATE PUBLICATION

SAMPLE QUESTION PAPER-X (UNSOLVED)

Section A Mcq

1. Let $f: R \rightarrow R$ be defined as f(x) = 3x. Then

a. f is one-one onto

b. f is many-one onto

c. f is one-one but not onto

d. f is neither one-one nor onto

A. f is one-one onto

B. f is many-one onto

C. f is one-one but not onto

D. f is neither one-one nor onto

Answer: A

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2. $\tan^{-1}(-1) - \cot^{-1}(1)$ is equal to

A. π

B. 0

C. 2

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

Answer: D

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3. If A is a matrix of order 3×4, then each row of matrix A contains elements :

A. 12

B. 4

C. 3

D. None of these

Answer: C

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4. If $X + Y = \begin{bmatrix} 1 & 0 \\ 2 & 5 \end{bmatrix}, X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ then Y is

A. $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix}$

Answer: C

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5. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then x is equal to:

A. 6

B. ± 6

C. -6

D. 0

Answer: B

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6. If f(x) is continuous at x=3, where f(x)=(x^(2)-7x+12)/(x^(2)-5x+6),for x≠3, then f(3)=

A. -1

B. 1

C. -2

D. 2

Answer: A

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7. The derivative of $\sqrt{\log(\cos x)}$ w.r.t. x is

A. $\frac{1}{2\sqrt{\tan x}}$

B. $\frac{1}{2\sec^2 x}$

C. $\frac{-\tan x}{2\sqrt{\log(\cos x)}}$

D. None of these

Answer: C

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8. Differentiate log x w.r.t $\frac{1}{x}$.

A. x

B. $-x$

C. $-x^2$

D. x^2

Answer: B

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9. $\int \frac{\cos 2x}{(\sin x + \cos x)^2} dx$ is equal to

A. $\frac{-1}{\sin x + \cos x} + C$

B. $\log|\sin x + \cos x| + C$

C. $\log|\sin x - \cos x| + C$

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

Answer: B

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10. $\int_0^{2/3} \frac{dx}{4 + 9x^2}$ equals

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

B. $\frac{\pi}{12}$

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

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

Answer: C

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11. The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}=5\frac{d^2y}{dx^2}$ is

A. $1, 1$

B. $1, 2$

C. $2, 1$

D. $2, 2$

Answer: D

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12. Find the integrating factor of differential equation $x\log x\left(\frac{dy}{dx}\right)+y=\frac{2}{x}\log x.$

A. $\log x$

B. $2\log x$

C. $3\log x$

D. $4\log x$

Answer: A

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13. If $\overrightarrow{a}$ is a nonzero vector of magnitude $'a'$ and λ a nonzero scalar, then $\lambda\overrightarrow{a}$ is unit vector if:

A. $\lambda = 1$

B. $\lambda = -1$

C. $a = |\lambda|$

D. $a = \dfrac{1}{|\lambda|}$

Answer: D

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14. If the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitude 1 and 2 respectively and when $\left|\vec{a} \times \vec{b}\right| = \sqrt{3}$ is

A. 30°

B. 60°

C. 75°

D. 90°

Answer: B

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15. Find the distance between the parallel planes $2x - 3y + z + 3 = 0$ and $4x - 6y + 2z + 5 = 0$

A. $\frac{1}{\sqrt{54}}$

B. $\frac{1}{\sqrt{55}}$

C. $\frac{1}{\sqrt{56}}$

D. $\frac{1}{\sqrt{58}}$

Answer: C

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16. Let A and B be independent events with $P(A) = 0.3$ and $P(B) = 0.4$. Then $P(B \mid A)$ is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: D

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Section A Fill In The Blanks

1. Let $A = R - \{3\}$ and $B = R - \{1\}$. Consider the function $f: A \to B$ defined by $f(x) = \frac{x-2}{x-3}$. Then f is.....

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2. If A $= \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$, $B = [-1 \quad 2 \quad 1]$ verify that (AB)' = B' A'

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3. Find $\frac{dy}{dx}$, if $y = \tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$, $\frac{-1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}$

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4. A firm has found from experience that its profit as a function of x, the amount produced, is given by

$p(x) = -\frac{x^3}{3} + 729x - 2500, 0 \leq x \leq 35$. The value of x that maximises the profit is.....

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5. $\int e^x(\sin x + \cos x)dx$ is equal to :

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6. The integrating factor of $x\frac{dy}{dx} + 2y = x^2$ is:

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7. The three points $(x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3)$ are collinear when.....

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8. If A and B are two independent events such that $P(A \cup B) = 0.6$ and $P(A) = 0.2$, then P(B) is.....

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Section A True Or False

1. $\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), x \in [0, 1]$

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2. If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, then $A^{-1} = \frac{1}{8}\begin{bmatrix} 5 & -1 \\ -7 & 3 \end{bmatrix}$

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3. If $x = a\cos^3\theta, y = b\sin^3\theta$, then $\frac{dy}{dx} = \frac{b}{a}\tan\theta.$

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4. prove $\int \frac{dx}{\sqrt{x^2 - a^2}} = \log\left|x + \sqrt{x^2 - a^2}\right| + c$

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5. If $\vec{a}$ and $\vec{b}$ are any two vectors, then $\left(\vec{a} \times \vec{b}\right)^2 = \left|\vec{a}\right|^2 \left|\vec{b}\right|^2 - \left(\vec{a} \cdot \vec{b}\right)^2$.

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6. If the points $(-1, 3, 2), (-4, 2, -2)$ and $(5, 5, \lambda)$ are collinear, then show that $\lambda = 10$

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7. The probability that A will solve a problem is $\frac{2}{3}$ and B will solve it is $\frac{5}{6}$. If both try the problem independently, then the probability that the

problem will be solved is $\frac{7}{10}$.

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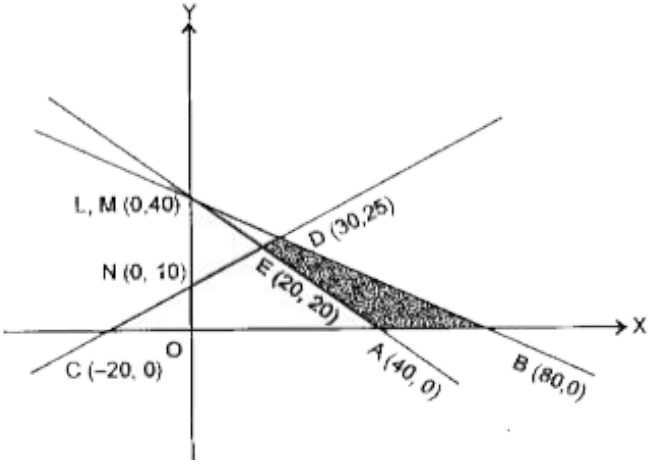
8. The corner points of the function $Z = 3x + 4y$ are $(40, 0), (80, 0), (30, 25), (20, 20)$. The maximum value 240 of Z occurs at (80, 0).



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Section B

1. Given $A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$, compute A^{-1} and show that $2A^{-1} = 9I - A$.

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2. If $\begin{bmatrix} 2x & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 3 \end{bmatrix} = O$, find x.

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3. . Find two numbers whose sum is 24 and whose product is as large as possible.

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4. The equation of the tangent to the curve $y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at the point $x = 1$ is .....

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5. Find $\int \frac{\tan^2 x \sec^2 x}{1-\tan^6 x} dx.$

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6. Using integration find the area of region bounded by the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$

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7. If $\left|\vec{a}\right|=5, \left|\vec{b}\right|=4$ and $\vec{a}\cdot\vec{b}=16$, find $\left|\vec{a}\times\vec{b}\right|$.

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8. Write the projection of vector $2\hat{i}+3\hat{j}-\hat{k}$ along the vector $\hat{i}+\hat{j}$.

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Section C

1. Prove that $\cos^{-1}\left(\frac{12}{13}\right) + \sin^{-1}\left(\frac{4}{5}\right) = \tan^{-1}\left(\frac{63}{16}\right)$.

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2. If $x \in \left(\frac{1}{\sqrt{2}}, 1\right)$, differentiate $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ with respect to $\cos^{-1}\left(2x\sqrt{1-x^2}\right)$.

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3. If $y = a\cos(\log x) + b\sin(\log x)$, show that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

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4. Find $\int \frac{2x}{(x^2+1)(x^2+2)^2}dx$.

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5. Show that the differential equation $x - \cos\left(\frac{y}{x}\right)\left(\frac{dy}{dx}\right) = y\cos\left(\frac{y}{x}\right) + x$ is homogeneous and solve it.

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6. Find one-parameter families of solution-curves of the following differential equations : $x\frac{dy}{dx} + y - x + xy\cot x = 0 \qquad (x \neq 0).$

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7. There are 4 cards numbered 1, 3, 5 and 7, one number on one card. Two cards are drawn at random without replacement. Let X denote the sum of the numbers on the two drawn cards. Find the mean and varience of X.

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8. A and B throw a pair of dice alternately. A wins the game if he gets a total of 6 and B wins if he gets a total of 7. If A starts the game, find the probability of winning the game by A in third row of pair of dice.

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Section D

1. Solve the system of the following equations :

$$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=2,\ \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=5,\ \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=-4.$$

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2. Given that $A=\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}2 & 2 & -4\\ -4 & 2 & -4\\ 2 & -1 & 5\end{bmatrix}$. Find AB

Use to solve the following system of equations :

$x-y=3, 2x+3y+4z=17, y+2z=7.$

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3. Find the vector equation of the line passing through (1, 2, 3) and parallel to each of the planes $\vec{r} = \left(\hat{i} - \hat{j} + 2\hat{k}\right) = 5$ and $\vec{r} \cdot \left(3\hat{i} - \hat{j} + \hat{k}\right) = 6$. Also find the point of intersection of the line thus obtained with the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + \hat{k}\right) = 4$.

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4. Find the shortest distance between the lines $\vec{r} = (8 + 3\lambda)\hat{i} - (9 + 16\lambda)\hat{j} + (10 + 7\lambda)\hat{k}$ and $\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} +$

.

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5. Solve the following linear programming problem graphically :

Minimise $Z = 4x + 3y$

subject to the constraints

$3x + y \geq 90$
$x + 5y \leq 100$
$8x + 5y \leq 400$
$x \geq 0, \quad y \geq 0$

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6. Solve the following linear programming problem graphically :

Minimise $Z = 6x + 3y$

subject to the constraints

$4x + y \geq 80$
$x + 5y \geq 115$
$3x + 2y \leq 150$
$x \geq 0, \quad y \geq 0$

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