



MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER -07 (UNSOLVED)

Part I Choose The Correct Answer

1. If $A^T \cdot A^{-1}$ is symmetric, then $A^2 =$

A. A^{-1}

B. $(A^T)^2$

C. A^T

D. $(A^{-1})^2$

Answer: B



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2. If $p + iq = \frac{a + ib}{a - ib}$ then $p^2 + q^2 = \dots\dots\dots$

A. 0

B. 2

C. 1

D. -1

Answer: C



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3. If $\omega \neq 1$ is a cubit root unity and

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k, \text{ then } k \text{ is equal to}$$

A. 1

B. -1

C. $\sqrt{3}i$

D. $-\sqrt{3}i$

Answer: D



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4. The value of $\sin^{-1}(\cos x)$, $0 \leq x \leq \pi$ is

A. $\pi - x$

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

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

D. $\pi - x$

Answer: A



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5. The radius of the circle

$$3x^2 + by^2 + 4bx - 6by + b^2 = 0$$

A. 1

B. 3

C. $\sqrt{10}$

D. $\sqrt{11}$

Answer: C



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6. The equation of the directrix of the parabola

$$y^2 = -8x \text{ is}$$

A. $y + 2 = 0$

B. $x - 2 = 0$

C. $y - 2 = 0$

D. $x + 2 = 0$

Answer: B



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7. If \vec{a} and \vec{b} are parallel vector, then

$\left[\vec{a} \ \vec{b} \ \vec{c} \right]$ is equal to

A. 2

B. -1

C. 1

D. 0

Answer: D



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8. The length of the \perp^r from the origin to plane $\vec{r} \cdot (3\hat{i} + 4\hat{j} + 12\hat{k}) = 26$ is

A. 0.26

B. $\frac{26}{169}$

C. 2

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

Answer: C



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9. The curve $y = ax^4 + bx^2$ with $ab > 0$

A. has no horizontal tangent

B. is concave up

C. is concave down

D. has no points of inflection

Answer: D



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10. The asymptote to the curve

$$y^2(1+x) = x^2(1-x) \text{ is}$$

A. $x = 1$

B. $y = 1$

C. $y = -1$

D. $x = -1$

Answer: D



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11. If $f(x,y,z) = xy + yz + zx$, then $f_x - f_z$ is equal to

A. $z - x$

B. $y - z$

C. $x - z$

D. $y - x$

Answer: A



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12. If $f(x, y) = e^{xy}$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to

A. xye^{xy}

B. $(1 + xy)e^{xy}$

C. $(1 + y)e^{xy}$

D. $(1 + x)e^{xy}$

Answer: B



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13. The value of $\int_0^{\frac{\pi}{6}} \cos^3 3x dx$

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

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

C. $\frac{1}{9}$

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

Answer: B



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14. If $f(x)$ is even then $\int_{-a}^a f(x) dx \dots$

A. 0

B. $2 \int_0^a f(x) dx$

C. $\int_0^a f(x) dx$

D. $-2 \int_0^a f(x) dx$

Answer: B



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15. The order and degree of the different equation

$$\sqrt{\sin x}(dx + dy) = \sqrt{\cos x}(dx - dy) \text{ is}$$

A. 1,2

B. 2,2

C. 1,1

D. 2,1

Answer: C



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16. The solution of the differential equation

$$\frac{dy}{dx} = 2xy \text{ is}$$

A. $y = ce^{x^2}$

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

C. $y = ce^{-x^2} + c$

D. $y = x^2 + c$

Answer: A



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17. If $P\{X=0\}=1-P\{X=1\}$. If $E\{X\}=3\text{Var}(X)$, then $P\{X=0\}$ is

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

B. $\frac{2}{5}$

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

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

Answer: D



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18. Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed n times. Then the possible values of X are

A. $i + 2n, i = 0, 1, 2, \dots \dots \dots n$

B. $2i - n, i = 0, 1, 2, \dots \dots \dots n$

C. $n - I, i = 0, 1, 2, \dots \dots n$

D. $2i + 2n, i = 0, 1, 2, \dots \dots \dots n$

Answer: B

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19. In the set Q define $a \odot b = a + b + ab$. For what value of y , $3 \odot (y \odot 5) = 7$?

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

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

C. $y = \frac{-3}{2}$

D. $y = 4$

Answer: B



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20. If X is a continuous random variable then

$P(X \geq a) = \underline{\hspace{2cm}}$.

A. $P(X < a)$

B. $1 - P(X > a)$

C. $P(x > a)$

D. $1 - P(x \geq a)$

Answer: C

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Part II

1. Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ to a row-echelon form.

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2. Find the least positive integer n such that

$$\left(\frac{1+i}{1-i}\right)^n = 1.$$



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3. Find the value of

$$\sin^{-1}\left(\sin\left(\frac{5\pi}{4}\right)\right)$$



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4. Identify the type of conic section for each of the equations

$$1. 2x^2 - y^2 = 7$$

$$2. 3x^2 + 3y^2 - 4x + 3y + 10 = 0$$

$$3. 3x^2 + 2y^2 = 14$$

$$4. x^2 + y^2 + x - y = 0$$

$$5. 11x^2 - 25y^2 - 44x + 50y - 256 = 0$$

$$6. y^2 + 4x + 3y + 4 = 0$$



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5. If $U(x, y, z) = \log(x^3 + y^3 + z^3)$ find

$$\frac{\partial U}{\partial x} + \frac{\partial U}{\partial y} + \frac{\partial U}{\partial z}$$



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6. Find, by integration, the volume of the solid generated by revolving about the x-axis, the region enclosed by $y = 2x^2$, $y = 0$ and $x = 1$.



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7. Solve the differential equations :

$$\frac{dy}{dx} - x\sqrt{25 - x^2} = 0$$



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8. Three fair coins are tossed simultaneously. Find the probability mass function for number of heads

occurred.



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9. Construct the truth table for the following statements $p \wedge q$



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10. Write the Maclaurin series expansion of the following functions :

$$e^x$$



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Part iii

1. If $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ show that

$$A^{-1} = \frac{1}{2}(A^2 - 3I).$$



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2. Find the values of the real numbers x and y , if the complex numbers

$(3 - i)x - (2-i)y + 2i + 5$ and $2x + (-1 + 2i)y + 3 + 2i$ are equal

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3. It is known that the roots of the equation $x^3 - 6x^2 - 4x + 24 = 0$ are in arithmetic progression. Find its roots.

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4. Prove that :

$$\cos \left[\tan^{-1} \left\{ \sin \left(\cot^{-1} x \right) \right\} \right] = \sqrt{\frac{x^2 + 1}{x^2 + 2}}$$

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5. Find the equation of a circle of radius 5 whose centre lies on x-axis and which passes through the point (2,3) .

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6. Using the 1' Hopital Rule prove that
$$\lim (1 + x)^{\frac{1}{x}} = 1$$

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7. If $v(x, y) = x^2 - xy + \frac{1}{4}y^2 + 7$, $x, y \in R$, find the differential dv.

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8. Find the area of the region bounded by $2x - y + 1 = 0$, $y = -1$, $y = 3$ and y -axis.

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9. Solve : $\frac{dy}{dx} + 2y \cot x = 3x^2 \operatorname{cosec}^2 x$.

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10. If the straight lines

$$\frac{x - 5}{5m} = \frac{2 - y}{5} = \frac{1 - z}{-1} \text{ and } x = \frac{2y + 1}{4m} = \frac{1 - z}{-3}$$

are perpendicular to each other, find the value of m .



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Part IV

1. Investigate the values of λ and μ the system of linear equations $2x+3y+5z=9$, $7x+3y-5z=8$, $2x+3y+\lambda z=\mu$, have

(i) no solution

(ii) a unique solution

(iii) an infinite number of solutions.



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2. Form the equations whose roots are reciprocals of the roots of cubic equation.

$$x^3 + ax^2 + bx + c = 0$$



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3. A closed box (cuboid) with a square base is to have a volume 2000c.c, The material for the top and

bottom of the box is to cost Rs 3 per square cm and the material for the sides is to cost Rs 1.50 per square cm. If the cost of the material is to be least find the dimension of the box.

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4. Provet that a straight line and parabola cannot intersect at more than two points.

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5. Solve : $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$

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6. A tank initially contains 50 litres of pure water. Starting at time $t = 0$ a brine containing with 2 grams of dissolved salt per litre flows into the tank at the rate of 3 litres per minutes. The mixture is kept uniform by stirring and the well - stirred mixture simultaneously flows out of the tank at the same rate. Find the amount of salt present in the tank at any time $t > 0$.

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7. Find the centre, foci, and eccentricity of the hyperbola $11x^2 - 25y^2 - 44x + 50y - 256 = 0$



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