MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 2

Part I Choose The Correct Answer

1. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ -1 & -2 & -3 & -4 \end{bmatrix}$ is

A. 1

B. 2

C. 4

D. 3

Answer: a

2. If $|z - \dfrac{3}{z}| = 2$, then the least value of $|z|$ is

A. 1

B. 2

C. 3

D. 5

Answer: a

3. The product of all four values of $\left(\cos\dfrac{\pi}{3} + i\sin\dfrac{\pi}{3}\right)^{\frac{3}{4}}$ is

A. -2

B. -1

C. 1

D. 2

Answer: c

4. The value of

$$\cos^{-1}(-1) + \tan^{-1}(\infty) + \sin^{-1}1 = \ldots\ldots$$

A. $\dfrac{3\pi}{2}$

B. $-\pi$

C. 2π

D. 3π

Answer: c

 Watch Video Solution

5. The value of $\sin^{-1}(1) + \sin^{-1}(0)$ is ....

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

B. 0

C. 1

D. π

Answer: a

▶ **Watch Video Solution**

6. The length of the diameter of the circle which touches the x-axis at the point (1,0) and passes through the point (2,3)

A. $\dfrac{6}{5}$

B. $\dfrac{5}{3}$

C. $\dfrac{10}{3}$

D. $\dfrac{3}{5}$

Answer: c

7. Area of the greatest rectangle inscribed in the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ is

A. 2ab

B. ab

C. $\sqrt{ab}$

D. $\dfrac{a}{b}$

Answer: a

▶ **Watch Video Solution**

---

8. The angle between two vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ if $\left| \overrightarrow{a} \times \overrightarrow{b} \right| = \overrightarrow{a} \cdot \overrightarrow{b}$ is ....

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

B. $\dfrac{\pi}{3}$

C. $\dfrac{\pi}{6}$

D. $\dfrac{\pi}{2}$

Answer: a

9. The distance between the planes x + 2y + 3z + 7 = 0 and

2x + 4y + 6z + 7 = 0 is

A. $\dfrac{\sqrt{7}}{2\sqrt{2}}$

B. $\dfrac{7}{2}$

C. $\dfrac{\sqrt{7}}{2}$

D. $\dfrac{7}{2\sqrt{2}}$

Answer: a

10. The tangent to the curve $y^2 - xy + 9 = 0$ is vertical when ....

    A. $y = 0$

    B. $y = \pm\sqrt{3}$

    C. $y = \dfrac{1}{2}$

    D. $y = \pm 3$

Answer: b

▶ **Watch Video Solution**

---

11. The curve $y^2 = (x - a)(x - b)^2$, $a, b > 0$ and $a > b$ does not exist for ....

A. $x \geq a$

B. $x = b$

C. $b < x < a$

D. $x = a$

Answer: c

▶ **Watch Video Solution**

12. The percentage error of fifth root of 31 is approximately how many times the percentage error in 31?

A. $\dfrac{1}{31}$

B. $\dfrac{1}{5}$

C. 5

D. 31

Answer: b

▶ **Watch Video Solution**

13. The differential of $\dfrac{x-2}{2x+3}$ is.

A. $\dfrac{-7}{(2x+3)^2} dx$

B. $\dfrac{1}{(2x+3)^2} dx$

C. $\dfrac{7}{(2x+3)^2} dx$

D. $\dfrac{7}{(2x+3)^2}$

Answer: c

14. If $\displaystyle\int_0^a = \frac{1}{4+x^2}dx = \frac{\pi}{8}$ then a is

A. 4

B. 1

C. 3

D. 2

Answer: d

15. Evaluate the following :

$$\int_0^{\frac{\pi}{2}} \cos^7 x \, dx$$

A. $\dfrac{n}{n-1} \cdot \dfrac{n-2}{n-3} \cdot \dfrac{n-4}{n-5} \cdots \dfrac{\pi}{2}$

B. $\dfrac{n-1}{n} \cdot \dfrac{n-3}{n-2} \cdot \dfrac{n-5}{n-4} \cdots \dfrac{1}{2} \dfrac{\pi}{2}$

C. $\dfrac{n}{n-1} \cdot \dfrac{n-2}{n-3} \cdot \dfrac{n-4}{n-5} \cdots \dfrac{3}{2} .1$

D. $\dfrac{n-1}{n} \cdot \dfrac{n-3}{n-2} \cdot \dfrac{n-5}{n-4} \cdots \dfrac{2}{3} \cdot 1$

Answer: d

▶ Watch Video Solution

---

16. The solution of $\dfrac{dy}{dx} + p(x)y = 0$ is

A. $y = ce^{\int P dx}$

B. $y = ce^{-\int P dx}$

C. $x = ce^{-\int P dy}$

D. $x = ce^{\int P dy}$

Answer: b

17. The order and degree of the differential equation

$$\frac{d^2y}{dx^2} - y\left(\frac{dy}{dx} + \frac{d^3y}{dx^3}\right) = 0$$

A. 2, 3

B. 3, 3

C. 3, 2

D. 2, 2

Answer: b

▶ **Watch Video Solution**

---

18. The random variable X has the probability density function $f(x) = \begin{cases} ax + b & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$ and $E(X) = \dfrac{7}{12}$, then a and b are respectively

A. 1 and $\dfrac{1}{2}$

B. $\dfrac{1}{2}$ and 1

C. 2 and 1

D. 1 and 2

Answer: a

19. If the function $f(x) = \dfrac{1}{12}$ for $a < x < b$, represents a probability density function of a continuous random variable X, then which of the following cannot be the value of a and b?

A. 0 and 12

B. 5 and 17

C. 7 and 19

D. 16 and 24

Answer: d

20. Which one of the following is not true?

A. Negation of a negation of a statement is the statement itself.

B. If the last column of the truth table contains only T then it is a tautology.

C. If the fast column of its truth table contains only F then it is a contradiction

D. If p and q are any two statements then $p \leftrightarrow q$ is a tautology.

Answer: d

Part Ii Answer The Questions

1. If adj (A) = $\begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$ find A^{-1}.

2. Find the condition that the roots of $x^3 + px^2 + qx + r = 0$ are in G.P.

3. Show that $\cot^{-1}\left(\dfrac{1}{\sqrt{x^2 - 1}}\right) = \sec^{-1} x, \ |x| > 1.$

4. Evaluate $\lim\limits_{x \to 1} x^{\frac{1}{x-1}}$

5. The radius of a circular disc is given as 24cm with a maximum error in measurement of 0.02 cm. (i) Use differentials to estimate the maximum error in the calculated area of the disc. (ii) Compute the relative error.

6. Evaluate: $\displaystyle\int_{-\log 2}^{\log 2} e^{-|x|}\ dx.$

7. Show that each of the following expressions is a solution of the corresponding given differential equation.

$(ii)\ y = ae^{x} + be^{-x}; \ y'' - y = 0$

8. Suppose X is the number of tails occurred when three fair coins are tossed once simultaneously. Find the values

of the random variable X and number of points in its inverse images.

9. Verify the

Existence of identity

10. $i^{1948} - i^{-1869}$

Part Iii Answer The Questions

1. Find the inverse of the matrix $\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$

2. Find the value of $\left(\dfrac{1 + \sin \frac{\pi}{10} + i \cos \frac{\pi}{10}}{1 + \sin \frac{\pi}{10} - i \cos \frac{\pi}{10}} \right)^{10}$.

3. Find the equation of the ellipse in each of the cases

given below :

(i) foci $(- + 3, 0)$, $e = \dfrac{1}{2}$

(ii) foci $(0, - + 4)$ and end points of major axis are

$(0 - + 5)$

(iii) length of lagtus rectum 8, eccentricity $= \dfrac{3}{5}$ and major axis on x-axis .

(iv) length of latus rectum 4, distance between foci $4\sqrt{2}$ and major axis as y -axis.

4. Show that the lines $\vec{r} = \left(\hat{i} - \hat{j} \right) + t \left(2\hat{i} + \hat{k} \right)$ and $\vec{r} = \left(2\hat{i} - \hat{j} \right) + s \left(\hat{i} + \hat{j} - \hat{k} \right)$ are skew lines and find the distance between them .

5. Find the local maximum and minimum of the function x^2y^2 on the line $x + y = 10$

6. Let $W(x,y,z) = x^2 - xy + 3\sin z,\ x, y, z \in R$, Find the linear approximation at (2,-1,0).

7. Find the volume of a sphere of radius a.

8. Solve the differential equations :

$$ydx + (1 + x^2)\tan^{-1}x\,dy = 0$$

9. Prove that $q \to p \equiv \sim p \to \sim q$

10. If on an average 1 ship out of 10 do not arrive safely to ports. Find the mean and the standard deviation of the ships returning safely out of a total of 500 ships.

1. If $F(\alpha) = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha \\ 0 & 1 & 0 \\ -\sin\alpha & 0 & \cos\alpha \end{bmatrix}$, show that $\left[F(\alpha)\right]^{-1} = F(-\alpha)$.

▶ **Watch Video Solution**

2. If $\omega \neq 1$ is a cube root of unity, show that the roots of the equation $(z-1)^3 + 8 = 0$ are $-1, 1 - 2\omega, 1 - 2\omega^2$.

▶ **Watch Video Solution**

3. Solve : $\left(\sqrt{3} + \sqrt{2}\right)^x + \left(\sqrt{3} - \sqrt{2}\right)^x = 10$

4. Show that the line x-y + 4 =0 is a tangents to the ellipse $x^2 + 3y^2 = 12$. Also find the coordinates of the points of contact.

5. Using vector method, prove $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$.

6. A farmer plans to fence a rectangular pasture adjacent to a river. The pasture must contain 1,80,000 sq. mtrs in order to provide enough grass for herds. No fencing is needed along the river. What is the length of the minimum needed fencing material?

7. Evaluate as the limit of sums: $\int_1^2 (x^2 - 1)\,dx$

8. Solve: $\dfrac{dy}{dx} = \dfrac{x - y + 5}{2(x - y) + 7}$

9. For the random variable X with the given probability mass function as below, find the mean and variance.

$$F(x) = \begin{cases} 2(x-1) & 1 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

10. For the ellipse $4x^2 + y^2 + 24x - 2y + 21 = 0$, find the centre, vertices, and the foci. Also prove that the length of latus rectum is 2.

11. If

$$\vec{a} = -2\hat{i} + 3\hat{j} - 2\hat{k}, \ \vec{b} = 3\hat{i} - \hat{j} + 3\hat{k}, \ \vec{c} = 2\hat{i} - 5\hat{j} + \hat{k}$$

find $\left(\vec{a} \times \vec{b}\right) \times \vec{c}$ and $\vec{a} \times \left(\vec{b} \times \vec{c}\right).$ State whether they are equal.

▶ **Watch Video Solution**