MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 18 (UNSOLVED)

Part I I Choose The Correct Answer Answer All The Questions

1. If $(AB)^{-1} = \begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$ then $B^{-1} =$

A. $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$

B. $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$

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

D. $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

Answer: A

2. The conjugate of a complex number is $\dfrac{1}{i-2}$. Then, the complex number is

A. $\dfrac{1}{i+2}$

B. $\dfrac{-1}{i+2}$

C. m^n

D. n^m

Answer: B

3. If $z_1 = a + ib$, $z_2 = -a + ib$ then $z_1 - z_2$ lise on ....

A. real axis

B. imaginary axis

C. the line $y = x$

D. the line $y = -x$

4. If find g are polynomials of derrees m and n respectively, and if h(x) = $(f \circ g)(x)$, then the degree of h is

A. mn

B. $m + n$

C. m^n

D. n^m

5. If $x = \dfrac{1}{5}$, the value of $\cos\left(\cos^{-1} x + 2\sin^{-1} x\right)$ is

A. $-\sqrt{\dfrac{24}{25}}$

B. $\sqrt{\dfrac{24}{25}}$

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

D. $-\dfrac{1}{5}$

Answer: D

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

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

B. 0

C. 1

D. π

Answer: A

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7. The eccentricity of the yhyperbola whose latus rectum is 8 and conjugate axis is equal to half the distance between the foci is

A. $\dfrac{4}{3}$

B. $\dfrac{4}{\sqrt{3}}$

C. $\dfrac{2}{\sqrt{3}}$

D. $\dfrac{3}{2}$

Answer: C

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8. The eccentricity of the ellipse $16x^2 + 25y^2 = 400$ is ....

A. $\dfrac{4}{5}$

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

C. $\dfrac{3}{4}$

D. $\dfrac{2}{5}$

Answer: B

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9. If $\vec{a}, \vec{b}, \vec{c}$ are three non - coplanar vector such that

$$\vec{a} \times \left(\vec{b} \times \vec{c} \right) = \dfrac{\vec{b} + \vec{c}}{\sqrt{2}},$$ then the angle between $\vec{a}$ and $\vec{b}$ is

....

A. 3pi/4

B. 3pi

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

D. π

Answer: B

10. Let $\vec{u}, \vec{v}$ and $\vec{w}$ be vector such that $\vec{u} + \vec{v} + \vec{w} = \vec{0}$. If $\left|\vec{u}\right| = 3, \left|\vec{v}\right| = 4$ and $\left|\vec{w}\right| = 5$ then $\vec{u} \cdot \vec{v} + \vec{v} \cdot \vec{w} + \vec{w} \cdot \vec{u}$ is ....

A. 25

B. -25

C. 5

D. $\sqrt{5}$

Answer: B

11. Angle between $y^2 = x$ and $x^2 = y$ at the origin is

A. $\tan^{-1} \dfrac{3}{4}$

B. $\tan^{-1}\left(\dfrac{4}{3}\right)$

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

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

Answer: C

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12. If f has a local extremum at a and if f'(a) exists then ....

A. $f'(a) < 0$

B. $f'(a) > 0$

C. $f'(a) = 0$

D. $f''(a) = 0$

Answer: C

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13. The approximate change in the volume V of a cube of side x metres caused by increasing the side by 1% is

A. $0.3x dx m^3$

B. $0.03x m^3$

C. $0.03x^2 m^3$

D. $0.03x^3 m^3$

Answer: D

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14. The differential of y if $y = \dfrac{x - 2}{2x + 3}$ 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

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15. If $f(x) = \displaystyle\int_0^x t\cos t\,dt$, then $\dfrac{df}{dx}$

A. $\cos x - x\sin x$

B. $\sin x + x\cos x$

C. $x\cos x$

D. $x\sin x$

Answer: C

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16. The order of the differential equation of all circles with centre at (h, k) and radius 'a' is ....

A. 2

B. 3

C. 4

D. 1

Answer: A

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17. The solution of the differential equation $2x\dfrac{dy}{dx} - y = 3$ represents

A. straight lines

B. circles

C. parabola

D. ellipse

Answer: C

18. The probability function of a random variable is defined as

x	-2	-1	0	1	2
$f(x)$	k	$2k$	$3k$	$4k$	$5k$

Then E(X) is equal to

A. $\dfrac{1}{15}$

B. $\dfrac{1}{10}$

C. $\dfrac{1}{3}$

D. $\dfrac{2}{3}$

Answer: D

19. On a multiple-choice exam with 3 possible destructive for each of the 5 questions, the probability that a student will get 4 or more correct answers just by guessing is

A. $\dfrac{11}{243}$

B. $\dfrac{3}{8}$

C. $\dfrac{1}{242}$

D. $\dfrac{5}{243}$

Answer: A

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20. Subtraction is not binary operation in

A. $\mathbb{R}$

B. $\mathbb{Z}$

C. $\mathbb{N}$

D. $\mathbb{Q}$

Answer: C

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1. Find the rank of the following matrices by minor method:

(i) $\begin{bmatrix} 2 & -4 \\ -1 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} -1 & 3 \\ 4 & -7 \\ 3 & -4 \end{bmatrix}$ (iii) $\begin{bmatrix} 1 & -2 & -1 & 0 \\ 4 & -6 & -3 & 1 \end{bmatrix}$ (iv)

$\begin{bmatrix} 1 & -2 & 3 \\ 2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$ (v) $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 0 & 2 & 4 & 3 \\ 8 & 1 & 0 & 2 \end{bmatrix}$

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2. Find the square root of $6 - 8i$

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3. Examine the position of the point $(2, 3)$ with respect to the circle $x^2 + y^2 - 6x - 8y + 12 = 0$.

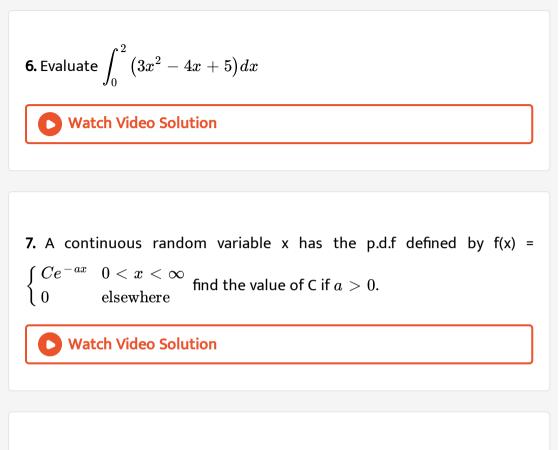**4.** Find the intervals of monotonicities and hence find the local extremum for the following functions:

$$f(x) = \frac{x}{x - 5}$$

5. Let us assume that the the the shape of a soap bubble is a sphere . Use linear approximation to approximate the increase in the surface area of a soap bubble as its radius increases from 5 cm to 5.2 cm also calculate the percentage error.

6. Evaluate $\int_0^2 \left(3x^2 - 4x + 5\right) dx$

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7. A continuous random variable x has the p.d.f defined by f(x) = $\begin{cases} Ce^{-ax} & 0 < x < \infty \\ 0 & \text{elsewhere} \end{cases}$ find the value of C if $a > 0$.

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8. Find the length of the perpendicular from the point $(1, -2, 3)$ to the plane x - y + z = 5.

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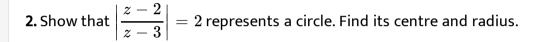
Part Iii Iii Answer Any Seven Questions Questions No 40 Is Compulsory

1. Find adj (adj(A)) if adj A = $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & 0 & 1 \end{bmatrix}$.

2. Show that $\left| \dfrac{z-2}{z-3} \right| = 2$ represents a circle. Find its centre and radius.

3. Solve

$$2\tan^{-1}(\cos x) = \tan^{-1}(2\cos ecx)$$

4. Find the equations of tangent and normal to the parabola $x^2 + 6x + 4y + 5 = 0$ at $(1, -3)$.

5. If the straight line joining the points $(2, 1, 4)$ and $(a - 1, 4, -1)$ is parallel to the line joining the points $(0, 2, b - 1)$ and $(5, 3, -2)$, find the values of a and b.

6. Find two positive numbers whose product is 100 and whose sum in minimum.

7. If $w = x + 2y + z^2$ and $x = \cos t, y = \sin t, z = t.$ Find $\dfrac{dw}{dt}$.

8. Solve : $(x + 1)\dfrac{dy}{dx} - y = e^x(x + 1)^2$

1. Discuss the solutions of the system of equations for all values of λ.

$$x + y + z = 2,\ 2x + y - 2z = 2,\ \lambda x + y + 4z = 2$$

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2. A watermelon has an ellipsoid shade which can be obtained by revolving an ellipse with major-axis 20 cm and minor-axis 10 cm about its major-axis. Find its volume using integration.

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3. Show that $\left(\dfrac{\sqrt{3}}{2} + \dfrac{i}{2}\right)^5 + \left(\dfrac{\sqrt{3}}{2} - \dfrac{i}{2}\right)^5 = -\sqrt{3}$

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4. $\dfrac{dy}{dx} = \dfrac{\sin^2 x}{1 + x^3} - \dfrac{3x^2}{1 + x^3}y$

5. Identify the type of conic and find centre, foci, vertices, and directices of each of the following:

$18x^2 + 12y^2 - 144x + 48y + 120 = 0$

6. If $w(x, y, z) = x^2 + y^2 + z^2$, $x = e^t$, $y = e^t \sin t$ and $z = e^t \cos t$, find $\dfrac{dw}{dt}$.

7. Find the probability mass function and the cumulative distribution function for getting 3 s when two dice are thrown.
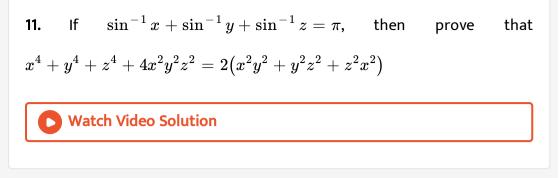
8. If 2 cos α = x + $\dfrac{1}{x}$ and 2 cos β = y + $\dfrac{1}{y}$, show that

$$\dfrac{x^m}{y^n} - \dfrac{y^n}{x^m} = 2i \sin(m\alpha - n\beta)$$

9. Solve the equation $6x^4 - 5x^3 - 38x^2 - 5x + 6 = 0$ if it is known that $\dfrac{1}{3}$ is a solution.

10. Let $M = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix} : x \in R - \{0\} \right\}$ and let * be the matrix multiplication. Determine whether M is closed under *. If so, examine the commutative and associative properties satisfied by * on M.

11. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi$, then prove that

$$x^4 + y^4 + z^4 + 4x^2 y^2 z^2 = 2(x^2 y^2 + y^2 z^2 + z^2 x^2)$$

12. For the function $f(x) = 4x^3 + 3x^2 - 6x + 1$ find the intervals of monotonicity, local extrema, intervals of concavity and points of inflection.

13. Determine whether the pair of straight lines

$$\overrightarrow{r} = \left(2\hat{i} + 6\hat{j} + 3\hat{k}\right) + t\left(2\hat{i} + 3\hat{j} + 4\hat{k}\right), \ \overrightarrow{r} = \left(2\hat{j} - 3\hat{k}\right) + s\left(\hat{i} + 2\hat{j} + \right.$$

are parallel. Find the shortest distance between them.