



MATHS

BOOKS - SHARAM PUBLICATION

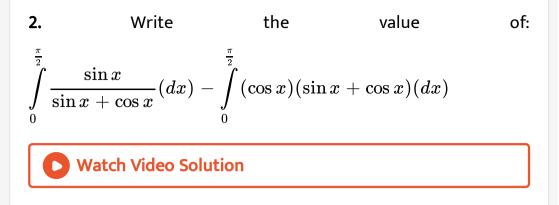
QUESTION PAPER 2016

Exercise

1. Write that condition of Rolle's theorem which is violated by

the function f(x) = |x - 1| in [0, 2].





3. If p and q are the order and degree of the differential equation $y\left(\frac{dy}{dx}\right)^2 + x^2\frac{d^2y}{dx^2} + xy = \sin x$, then choose the correct statement out of p < q

4. If p and q are the order and degree of the differential equation $y \left(\frac{dy}{dx}\right)^2 + x^2 \frac{d^2y}{dx^2} + xy = \sin x$, then choose the

p = q

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5. If p and q are the order and degree of the differential equation $y\left(\frac{dy}{dx}\right)^2 + x^2\frac{d^2y}{dx^2} + xy = \sin x$, then choose the

correct statement out of

p < q

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6. If
$$\left|\overrightarrow{a}\right| = 3$$
, $\left|\overrightarrow{b}\right| = 2$ and $\overrightarrow{a} \cdot \overrightarrow{b} = 0$, then write the value of $\left|\overrightarrow{a} \times \overrightarrow{b}\right|$.

7. Write the distance between parallel planes 2x - y + 3z = 4

and 2x - y + 3z = 18.

8. Write the equation of the sphere concentric with the sphere $x^2 + y^2 + z^2 - 4x - 2x - 2y + 2z - 30 = 0$ and passing

through the origin.



9. If A is a 4 imes 5 matrix and B is a matrix such that A^TB and

 BA^T both are defined, then write the order of B.

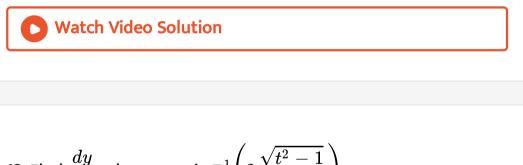


10. If ${}^nC_r = {}^nP_r, r
eq 1$, then write the value of r.

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11. A binomial distribution has mean 4 and variance 3. Write the

number of trials.



12. Find
$$\displaystyle rac{dy}{dt}$$
 , when $\displaystyle y = \sin^{-1} igg(2 \displaystyle rac{\sqrt{t^2 - 1}}{t^2} igg)$

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13. Find
$$rac{dy}{dx}$$
, if $x^my^n=\left(rac{x}{y}
ight)^{m+n}$

14. If
$$x = a \sec heta, y = b \tan heta$$
, then prove that $\displaystyle rac{d^2 y}{dx^2} = - \displaystyle rac{b^4}{a^2 y^3}$

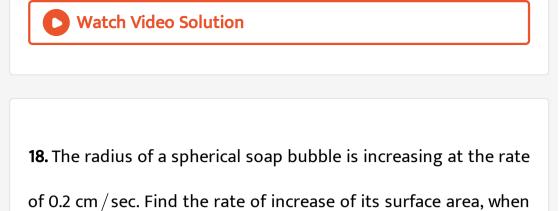
15. If
$$u=x^3-3xy^2$$
, show that $rac{\partial^2 u}{\partial x^2}+rac{\partial^2 u}{\partial y^2}$ =0

16. Find the intervals where the following functions are (a)

increasing and (b) decreasing. $y=\sin x+\cos x, x\in [0,2\pi]$

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17. Find the following limits: $\lim_{x \to 0+} \frac{\ln \tan x}{\ln \sin 2x}$



the radius is 7 cm. (π = 3.141 approx)

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19. If
$$f'(x)=e^x+rac{1}{1+x^2}$$
 and $f(0)=1,\,$ then find f(x).

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20. Evaluate
$$\int (\log x)^2 dx$$

21. Evaluate:
$$\int rac{2x+9}{\left(x+3
ight)^2} dx$$

22.
$$\int_0^1 rac{x^5 \left(4-x^2
ight)}{\sqrt{1-x^2}} dx$$

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23. Evaluate
$$\int rac{\sin x \cos x}{\sin^2 x - 2 \sin x + 3} dx$$

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24. Solve $dy + e^{-y} \sin x dx = 0$.

25. Solve:
$$ig(x^2-1ig)rac{dy}{dx}+2xy=1$$

26. Prove that

 $|a+b| \leq |a|+|b|$

State when equality will hold,



27. Find the area of the triangle ABC with vertices A(1,2,4),

B(3,1,-2) and C(4,3,1) by vector method.



28. The projection of a line segment \overline{OP} , through origin O, on the co-ordinate axes are 6, 2, 3. Find the length of the line segment OP and its direction cosines.



29. passing through the point (-1, 3, 2) perpendicular to the

planes x + 2y + 2z = 5 and 3x + 3y + 2z = 8.

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30. Prove that the lines
$$\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$$
 and $3x-2y+z+5=0=2x+3y+4z-4$ are co-planar.

31. Solve the following LPP graphically

Maximize, Z = 20x + 30y

Subject to $3x+5y\leq 15$

 $x, y \ge 0.$

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32. Find the feasible region of the following system

 $2x+y\geq 6, x-y\leq 3, x\geq 0, y\geq 0$

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33. Show that
$$(a+1)$$
 is a factor of $\begin{vmatrix} (a+1) & 2 & 3 \\ 1 & a+1 & 3 \\ 3 & -6 & a+1 \end{vmatrix}$

34. Prove that the following.
$$\begin{bmatrix} a & b & c \\ x & y & z \\ p & q & r \end{bmatrix} = \begin{bmatrix} y & b & q \\ x & a & p \\ z & c & r \end{bmatrix} = \begin{bmatrix} x & y & z \\ p & q & r \\ a & b & c \end{bmatrix}$$

35. If
$$A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$$
 and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, show that for no values of $\alpha, A^2 = B$.

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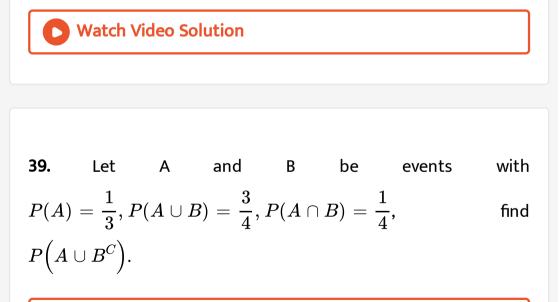
36. How many 4 digit numbers each greater than 6000 can be

formed with be digits 5, 6, 7 and 8?



37. If
$$m = {}^nC_2$$
, prove that ${}^nC_2 = 3(n+1)C_4$.

38. If the ratio of the 3rd term from the beginning to the 3rd term from the end in the expansion of $(1 + \sqrt{2})^n$ is $\frac{1}{8}$, then find the value of n.



40. If X follows a binomial distribution with parameter n = 6and p with 4P(X = 4) = P(X = 2), find p.

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41. If
$$x = \frac{1 - \cos^2 \theta}{\cos \theta}$$
, $y = \frac{1 - \cos^{2n} \theta}{\cos^n \theta}$ then show that $\left(\frac{dy}{dx}\right)^2 = n^2 \left(\frac{y^2 + 4}{x^2 + 4}\right)$



42. Shows that the triangle of greatest area that can be inscribed in a circle is equilateral.



43. Determine the area common to the parabola $y^2 = x$ and the

circle $x^2 + y^2 = 2x$.

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44. Find the solution of the following differential equations:

$$xdy-ydx=\sqrt{x^2+y^2}dx$$

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45. Prove that

$$\overrightarrow{a} \times (\overrightarrow{b} \times \overrightarrow{c}) + \overrightarrow{b} \times (\overrightarrow{c} \times \overrightarrow{a}) + \overrightarrow{c} \times (\overrightarrow{a} \times \overrightarrow{b}) = 0$$

and hence prove that
 $\overrightarrow{a} \times (\overrightarrow{b} \times \overrightarrow{c}), \overrightarrow{b} \times (\overrightarrow{c} \times \overrightarrow{a}), \overrightarrow{c} \times (\overrightarrow{a} \times \overrightarrow{b})$ are

coplanar.



46. A variable plane meets the coordinate axes at P, Q, R points. If the plane passes through a fixed point (a, b, c), prove that the centre of the shpere passing the origin and P, Q, R will lie on the

surface
$$rac{a}{x}+rac{b}{y}+rac{c}{z}=2$$

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47. Solve the following LPP graphically : Maximize : $Z=5x_1+3x_2$ subject to : $3x_1+5x_2\leq 15$ $5x_1+2x_2\leq 10$ $x_1,x_2\geq 0$

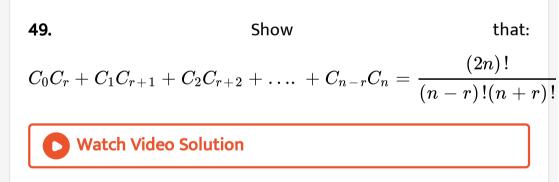
48. Solve the following system of equations by the matrix inversion method.

x + y + z = 4

2x - y + 3z = 1

and 3x + 2y - z = 1





50. Three persons hit a target with probability $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. If each one shoot at the target once,

find the probability that exactly one of them hits the target



51. Three persons hit a target with probability $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. If each one shoot at the target once,

if only one of them hits the target what is the probability that it was the first person ?