



MATHS

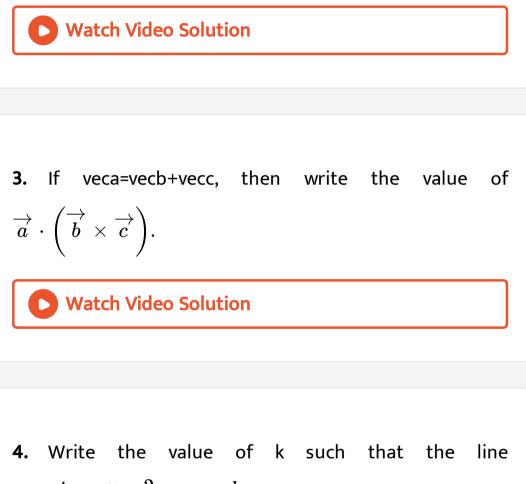
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QUESTION PAPER 2019



1. If f is an odd function, then write the value of
$$\int_{-a}^{a} \frac{f(\sin x)}{f(\cos x) + f(\sin^2 x)} dx$$

2. Write the order of the differential equaiton whose solution is given by $y=(c_1+c_2){
m cos}(x+c_3)+c_4e^{x+c_5}$



$$rac{x-4}{1}=rac{y-2}{1}=rac{z-k}{2}$$
 lies on the plane $2x-4y+z=7$

5. A R is a relation on set A such that $R = R^{-1}$, then

write the type of the relation R.

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6. Write the value of
$$\cos^{-1} \cos\left(\frac{3\pi}{2}\right)$$
.

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7. IF
$$\begin{vmatrix} 1+x & x & x^2 \ x & 1+x & x^2 \ x^2 & x & 1+x \end{vmatrix} = a + bx + cx^2 + dx^3 + ex^4 + fx^5$$

then write the value of a.



8. Let A and B be two mutually exclusive events such that $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$. Write the value of $P(A \cap B)$

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9. If
$$f'(2^+) = 0$$
 and $f'(2^-) = 0$, then is $f(x)$

continuous at x=2 ?

10. Prove that

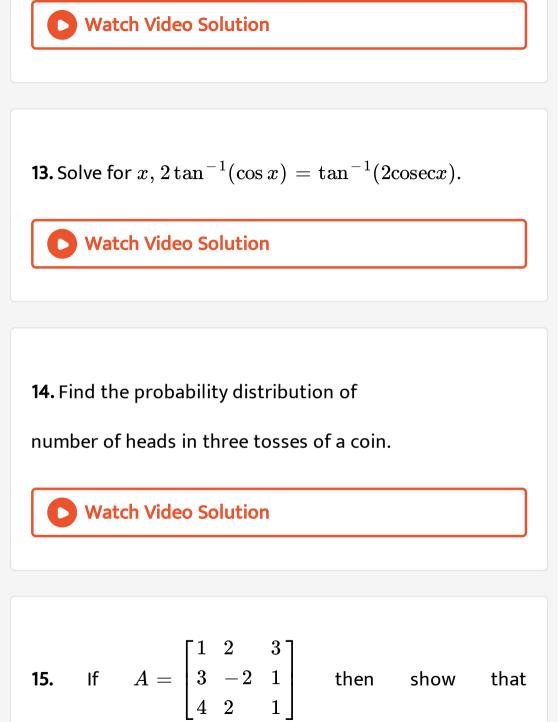
$$\cos^{-1}\left(\frac{b+a\cos x}{a+b\cos x}\right) = 2\tan^{-1}\left(\sqrt{\frac{a-b}{a+b}}\tan\frac{x}{2}\right)$$
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11. Construct the multiplication table X_7 on the set {1, 2,

3, 4, 5, 6}. Also find the inverse element of 4 if it exists.

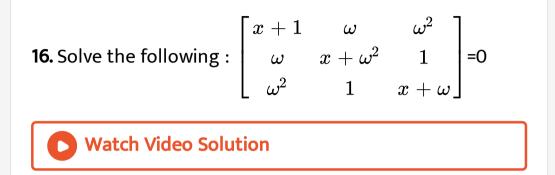


12. Let R be the relation on the set R of real numbers such that aRb iff a-b is and integer. Test whether R is an equivalence relation. If so find the equivalence class of $1 \text{ and } \frac{1}{2}$ wrt. This equivalence relation.



$$A^3 - 23A - 40I = O$$





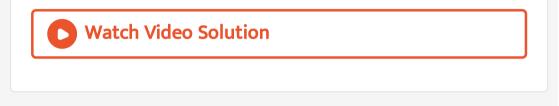
17. A person takes 4 tests in succession. The probability of his passing the first test is p, that of his passing each succeeding test is p or $\frac{p}{2}$ depending on his passing or failing the preceding test, Find the probability of his passing

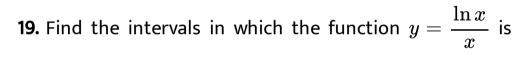
just three tests.



18. Find the point on the curve $x^2 + y^2 - 4xy + 2 = 0$

where the normal is paralell to the x-asis.

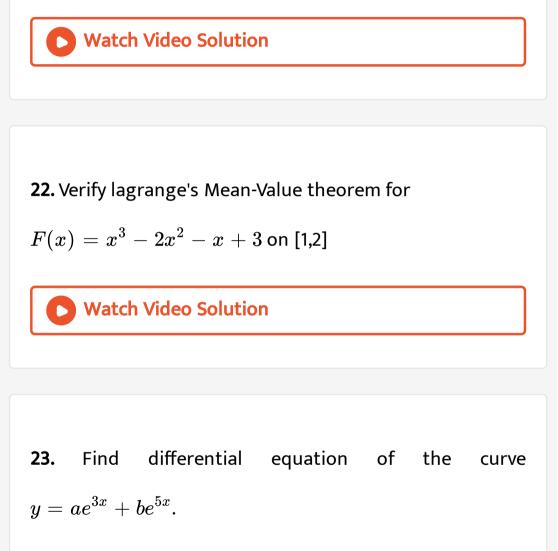




increasing and decreasing.

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20. If
$$y = e^{x^{e^{x^{e^x}}}}$$
, then find $\frac{dy}{dx}$.

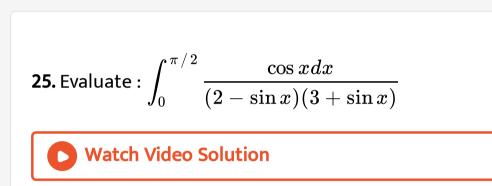
21. Find
$$rac{d^2 y}{dx^2}$$
 if x=a $\cos heta, y = b \sin heta.$



24. Obtain the general solution of the following differential equations.

$$ig(x^2+7x+12ig) dy + ig(y^2-6y+5ig) dx = 0$$

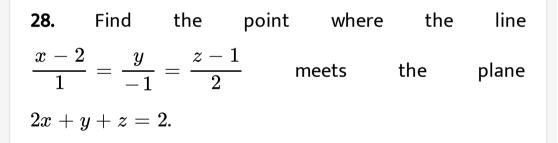
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26. Find the area of the region bounded by the curve $y = 6x - x^2$ and the x-axis.

27. If l_1 , m_1 , n_1 and l_2 , m_2 , n_2 are the direction cosines of two mutually perpendicular lines show that the d.cs. Of the line perpendicular to both of them are $m_1n_2 - n_1m_2$, $n_1l_2 - l_1n_2$, $l_1m_2 - m_1l_2$

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29. Find a unit vector perpendicular to both of the vectors $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ where $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$ and $b = \hat{i} + 2\hat{j} + 3\hat{k}$.

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30. Show that
$$\left(\overrightarrow{a}\times\overrightarrow{b}
ight)^2=a^2b^2-\left(\overrightarrow{a}.\overrightarrow{b}
ight)^2.$$

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31. Find the vector equation of a plane which is at a distance of 3 units from the origin , $2\hat{i} + 3\hat{j} - 6\hat{k}$ being a normal to the plane . Also get its cartesian equation

32. If
$$e^{y/x} = \frac{x}{a+bx}$$
 then show that $x^3 \frac{d}{dx} \left(\frac{dy}{dx} \right) = \left(x \frac{dy}{dx} - y \right)^2$ **Vatch Video Solution**

33. Show that the shrtest distance of the point (0, 8a) from the curve $ax^2 = y^3$ is $2a\sqrt{11}$.

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34. Determine the area common to the parabola $y^2 = x$ and the circle $x^2 + y^2 = 2x$.



35. Solve
$$y^2+x^2rac{dy}{dx}=xyrac{dy}{dx}.$$

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36. Evaluate the following integrals
$$\int \frac{dx}{2\cos^2 x + 3\cos x}$$

37. Show by vector method that the four points (6, 2, -1),

(2, -1, 3), (-1, 2, -4) and (-12, -1, -3) are coplanar.



38. Find the distance of the point (1, -1, -10) from

the line $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ measured parallelto the line $\frac{x+2}{2} = \frac{y-3}{-3} = \frac{z-4}{8}$

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39. If
$$\sin^{-1}\Bigl(rac{x}{a}\Bigr)+\sin^{-1}\Bigl(rac{y}{b}\Bigr)=\sin^{-1}\Bigl(rac{c^2}{ab}\Bigr),$$
 then prove that $b^2x^2+2xy\sqrt{a^2b^2-c^4}+a^2y^2=c^4$

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40. Maximize: $Z = 10x_1 + 12x_2 + 8x_3$

 $\text{Subject to:} x_1 + 2x_2 \leq 30$

 $5x_1 - 7x_3 \ge 12$

 $x_1 + x_2 + x_3 = 20$

 $x_1, x_2 \geq 0$



41. Prove that $f\colon X o Y$ is injective iff for all subsets A, B of $X,\,f(A\cap B)=f(A)\cap f(B).$

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42. Examining consistency and solvability, solve the following equation by matrix method.

x-2y=3

3x+4y-z=-2

5x-3z=-1



43. Out of the adult population in a village 50% are farmers, 30% do business and 20% are service holders. It is known that 10% of the farmers, 20% of the business holders and 50% of service holders are above poverty line. What is the probability that a member chosen from any one of the adult population, selected at random, is above poverty line?



44. Find the inverse of the following matrix using elementary transformation: $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$