



MATHS

BOOKS - SHARAM PUBLICATION

MODEL QUESTION PAPER-4

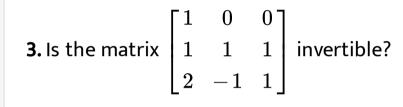
Exercise

1. Write the largest and smallest relations on a set

$$A = \{a, b, c\}.$$

2. Write the value of
$$\tan^{-1}\left[2\sin\left(2\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)\right]$$



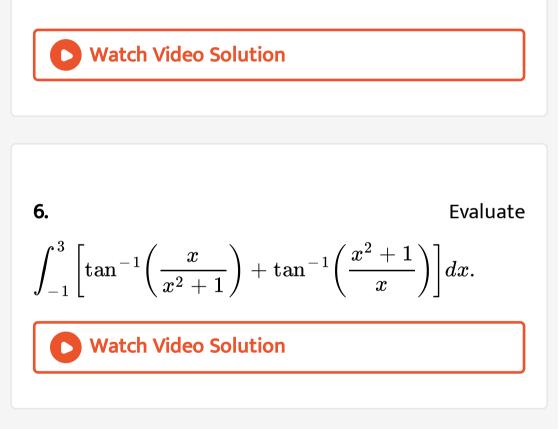


4. Differentiate
$$\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$$
 w.r.t $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$.
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5. An edge of a variable cube is increasing at the rate

of $10cm/\sec$. Find the rate of increase of the volume

of the cube when the edge is 5 cm long.



7. If p and q are the order and degree of the differential

 $y igg(rac{dy}{dx} igg)^2 + x^2 rac{d^2 y}{dx^2} + xy = \sin x$, then choose the

correct statement out of

p < q

A. p > q

 $\mathsf{B.}\, p = q$

 $\mathsf{C}.\, p < q$

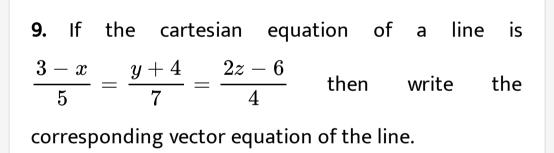
D.

Answer:



8. Find the projection of the vector $\hat{i} + 3\hat{j} + 7\hat{k}$ on the vector $2\hat{i} - 3\hat{j} + 6\hat{k}$.

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10. Show that the relation S defined on set N imes N by $(a,b)S(c,d) \Rightarrow a+d=b+c$ is an equivalence

relation.



11. If A = R -{3} and B = R -{1}. Consider the function f:A o B defined by $f(x)=rac{x-2}{x-3}$, for all $x\in A$. Then, show that f is bijective. Find $f^{-1}(x)$.

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12. Prove that
$$2 \tan^{-1} \left(\frac{1}{2} \right) + \tan^{-1} \left(\frac{1}{7} \right) = \tan^{-1} \left(\frac{31}{17} \right).$$

13. Find the feasible region of the following system.

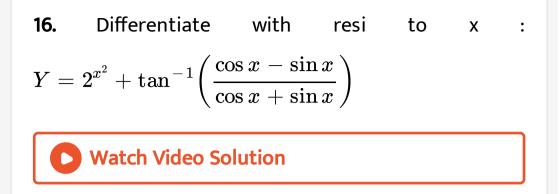
$$2y-x\geq 0,$$
 $6y-3x\leq 0,$ $x\geq 0,$ $y\geq 0.$

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14.
$$f(x) = \begin{cases} x^2 \sin\left(rac{1}{x}
ight) & x
eq 0 \\ 0 & x = 0 \end{cases}$$

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15. Find
$$\displaystyle rac{dy}{dx}$$
 when $\displaystyle y^x=e^{x-y}$

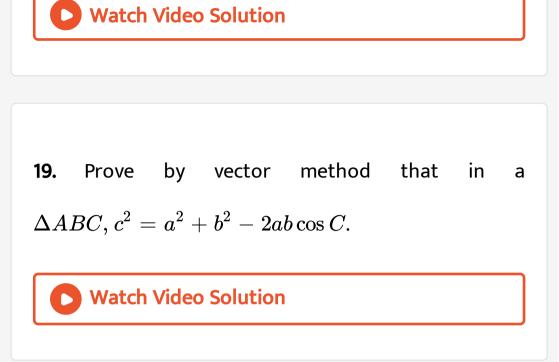


17. Find the equation of the tangent to the curve $x = y^2 - 1$ at the point where the slope of the normal to the curve is 2.

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18. Find the intervals in which the function $y = \frac{\ln x}{x}$ is increasing and decreasing.





20. The diagonals of a parallelogram are given by $ec{a}=2\hat{i}-3\hat{j}+5\hat{k}$ and $ec{b}=-2\hat{i}+2\hat{j}+2\hat{k}$,

Determine the area of the parallelogram .

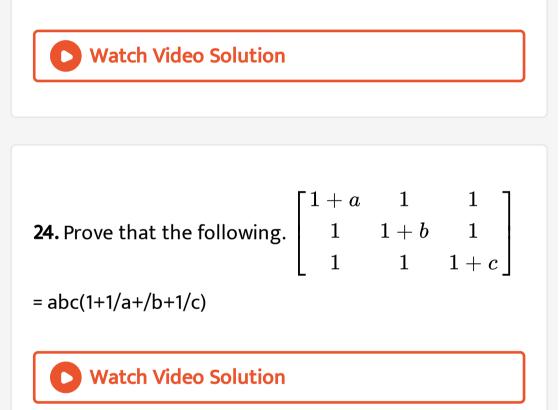
21. Find the image of the point (2, 3, 4) with respect to the plane x - y + 2z = 4. Obtain the foot of the perpendicular from P on the plane and the corresponding perpendicular distance.

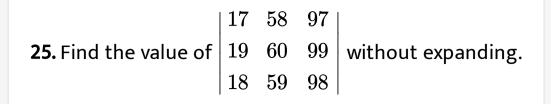


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22. Find the equation of planes passing throught the points (1, 2, 3), (1, -4, 3) and (-1, 3, 2)

23. If A and B are square matrices of same order, then show by means of an example that $AB \neq BA$ in general.





26. Find the inverse of
$$egin{bmatrix} 2 & -1 \ 1 & 3 \end{bmatrix}$$

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28. Evaluate
$$\int \frac{e^x - 1}{e^x + 1} dx$$

29. Evaluate
$$\int_0^{\pi/4} \log(1+\tan x) dx.$$

30. Find the area of the region bounded by the curve $y = 6x - x^2$, the X-axis and the two ordinates x = 0 and x = 9.

31. Solve the following differential equations

$$x\log xrac{dy}{dx}+y=2\log x$$

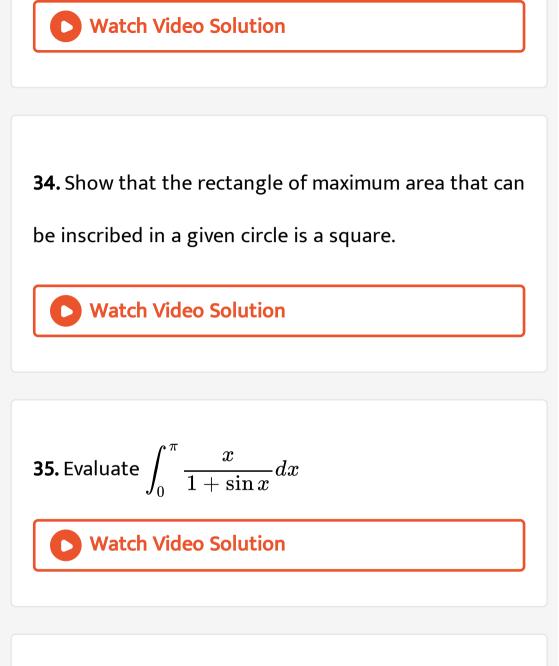
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32. Find the value of k so that the function f defined

by

$$f(x)=iggl\{iggl(rac{k\cos x}{\pi-2x}iggr),whenx
eqrac{\pi}{2}iggr),iggl(0,atx=rac{\pi}{2}iggr):\}$$
 is continuous at $x=rac{\pi}{2}.$

33. Find
$$rac{dy}{dx}$$
 if $x^y = y^x$.



36. Find the area of region in the first quadrant enclosed by the X-axis, the line y = x and the circle

$$x^2 + y^2 = 32.$$

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37. Solve the following differential equation
 $(2x + y + 1)dx + (4x + 2y - 1)dy = 0.$

38. Show that $f\colon N o N$, given by

$$f(x) = igg\{ egin{array}{l} x+1, ext{if x is odd} \ x-1, ext{if x is even} \end{array}$$

is bijective (both one-one and onto).

39. If
$$A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$$
 then find the value of $A^2 - 3A + 2I$
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40. If a, b and c are all positive real, then prove that

minimum value of determinant

$$\begin{vmatrix} a^2+1 & ab & ac \ ab & b^2+1 & bc \ ac & bc & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$$

41. Three vectors \overrightarrow{a} , \overrightarrow{b} and \overrightarrow{c} satisfy the condition $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = 0$. Find the value of $\overrightarrow{a} \cdot \overrightarrow{b} + \overrightarrow{b} \cdot \overrightarrow{c} + \overrightarrow{c} \cdot \overrightarrow{a}$ if $\left|\overrightarrow{a}\right| = 1$, $\left|\overrightarrow{b}\right| = 4$, $\left|\overrightarrow{c}\right| = 2$.