



MATHS

BOOKS - MODERN PUBLICATION

TEST PAPER 3



1. Let $f\colon R o R$ defined by f(x)=x+1 and $g\colon R o R$ defined as $g(x)=\sqrt{x}$ find fog and gof if defined.

2. Find the value of

$$\cos^{-1}\left(\frac{-7}{25}\right) + \cos^{-1}\left(\frac{3}{5}\right).$$

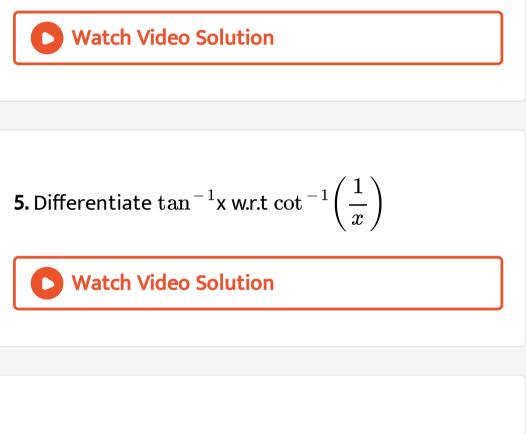


3. If
$$\begin{vmatrix} a & b & c \\ b & a & b \\ x & b & c \end{vmatrix} = 0$$
 then `x=____.

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4. If A is a square matrix of order 3 and |A|=3,then

write the matrix represented by A.Adj A.



6. Write the set of values of x for which the function

f(x) = sinx - x is increasing.





8. If
$$|\overrightarrow{a}, \overrightarrow{b}| = |\overrightarrow{a} x x \overrightarrow{b}|$$
 `then angle between them is__

9. Find the value of λ so that the vectors \overrightarrow{a} and \overrightarrow{b} are perpendicular to each other. $\overrightarrow{a} = (6,2,-3), \overrightarrow{b} = (1,-4,\lambda)$



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

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11. A trust fund has Rs. 50,000 that is to be invested in two types of bonds .The first and second bonds respectively pay annual interest at the rate of 5% and 6% respectively .Using matrix multiplication ,

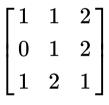
determine how to invest the money in these bonds

so as to get a total annual interest of Rs. 2780.

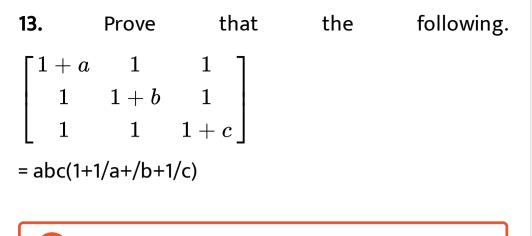


12. Find the inverse of the following matrices using

elementary transformation:







14. If
$$A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$$
 then show that $A^k = \begin{bmatrix} 1+2k & -4k \\ k & 1-2k \end{bmatrix}$, $k \in N$

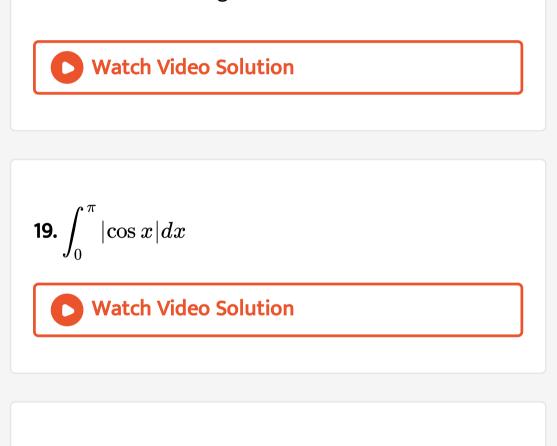
15. If
$$y = In ig(x^2 + y^2ig)$$
,then find $rac{dy}{dx}$.



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17. Test the differentiability and continuity of the following function at x=0: $f(x) = \begin{cases} rac{1-e^{-x}}{x} & x
eq 0 \\ 1 & x = 0 \end{cases}$

18. Determine the interval in which the function f(x)= $x^3 - 5x^2 + 3x + 97$ is decreasing and that in which it is increasing.



20. Solve :
$$(1+y^2)$$
. $dx + xdy = an^{-1} ydy$



21. A plane meets the coordinate axes at A, B and C respectively. If the centroid of the triangle ABC is (-1,

2, 5) then find the equation of the plane.



22. Prove by vector method that in any triangle ABC,

a	b	c
$\sin A$	$-\frac{1}{\sin B}$	$\sin C$

23. Prove that the acute angle between the lines whose direction cosines are given by the relation l+m+n=0 and $l^2+m^2-n^2=0$ and $rac{\pi}{3}$

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24. Let $f: W \rightarrow W$ be defined as f(x) = x - 1 if x is odd and f(x) = x + 1 if x is even then show that f is invertible. Find the inverse of f where W is the set of all whole numbers.

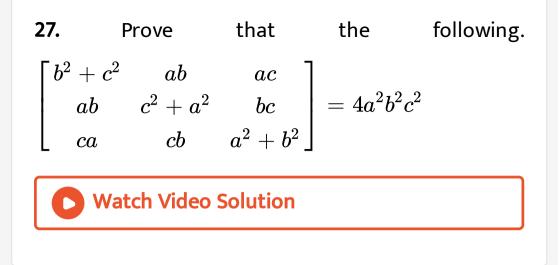


25. Constract the composition table/multiplication table for the binary operation * defined on $\{0,1,2,3,4\}$ by $a * b = a \times b \pmod{=5}$. Find the identity element if any. Also find the inverse elements of 2 and 4.

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26. Let A =
$$\begin{pmatrix} 122 \\ 212 \\ 221 \end{pmatrix}$$
. Find A^-1 and hence show

 $A^2 - 4A - 5I = 0.$



28. Show that the sum of the intercepts on the coordinate axes of any tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is constant.



29. Shows that the triangle of greatest area that can

be inscribed in a circle is equilateral.



30. Find the area of the région on closed between

$$y=4x-1$$
 and $y^2=2x$

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31. Write fog if f:R \rightarrow R and g: $R \rightarrow R$ is given by

$$f(x) = |x| \text{ and } g(x) = |5x - 2|$$



32. Evaluate :
$$\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right) + \cot^{-1}\left(\frac{1}{\sqrt{3}}\right) + \tan^{-1}\left(\sin\left(-\frac{\pi}{2}\right)\right)$$

33. If
$$|adjA| = 64$$
 then find $|A|$

34. Evaluate the following :
$$\begin{bmatrix} \sin^2 \theta & \cos^2 \theta & 1\\ \cos^2 \theta & \sin^2 \theta & 1\\ -10 & 12 & 2 \end{bmatrix}$$

35. A differentiable function f defined for all x > 0 and satisfies $f(x^2) = x^3$ for all x > 0. What is the value f'(16) ?

36. Write the minimum value of y_2 where $y = \sin^2 x \cos^2 x$



37. Evaluate
$$\int_{-1}^{1} e^{|x|} dx$$

38. Write the vector equation of the plane whose cartesian equation is x + y + 2z = 1.



39. Let A (1,2,3). Then, find the number of equivalence relations containing (1,2).

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40. Let f ,g: R $\rightarrow R$ be two functions defined as f(x)

=
$$|\mathsf{x}|$$
 +x and g(x) = $|\mathsf{x}|$ -x $\forall x \in R$.

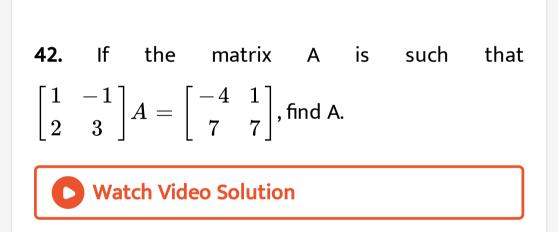
Then find fog and gof.



41. Solve the following : $\begin{bmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{bmatrix}$

=0





43. Find the values of a and b, if the function f defined as f(x) $\begin{cases} x^2+3x+a & ext{if } x\leq 1 \\ bx+2 & ext{if } x>1 \end{cases}$ is diffentiable at x=1

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44. Differentiate with respect to x: $y = 3^{x^2} + \tan^{-1} \left(\frac{\cos x + \sin x}{\cos x - \sin x} \right)$

45. Find the dy/dx when

$$\cos x=\sqrt{rac{1}{1+t^2}},\sin y=rac{2t}{1+t^2}$$

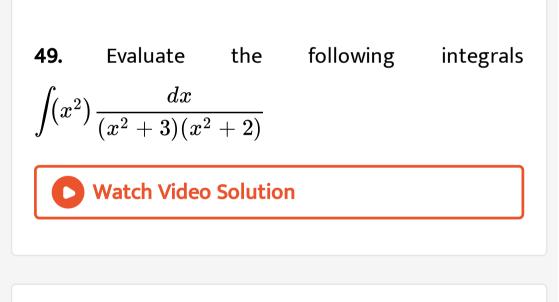
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46. Show that the line y = mx + c touches the parabola y^2 = 4ax if c = $\frac{a}{m}$.

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47. Show that $2sinx+tanx \geq 3x$ for all $x \in \left(0, \frac{\pi}{2}\right)$.

48. Evaluate :
$$\int \!\! \frac{x e^x}{\left(x+1
ight)^2} dx$$



50. Solve :
$$rac{dy}{dx}+1$$
 = e^{x+y}

51. Solve :
$$\left(x+2y^3
ight)rac{dy}{dx}=y.$$



52. Find the equation of the plane passing through

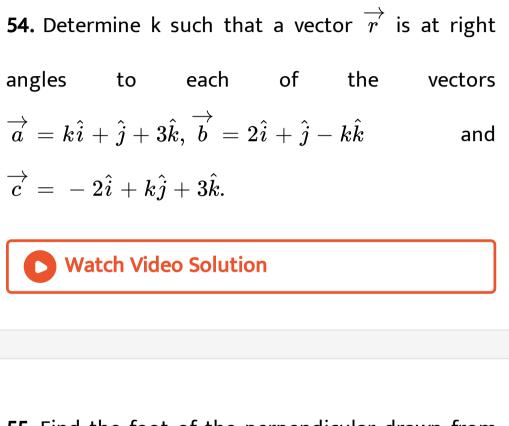
the points (2,1,3), (3,2,1) and (1, 0, -1).

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53. Find the image of the point (3, -2, 1) in the

plane x - y + 3z = 2.





55. Find the foot of the perpendicular drawn from

the point (5,7,3) to the line $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$. Find the length of

the perpendicular.

56. Let $f \colon X \to Y$ and $g \colon Y \to Z$. Prove that gof is

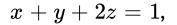
bijective if both f and g are bijective. Also prove that

$$\left(gof
ight)^{-1} = f^{-1} og^{-1}.$$

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57. Find the product of matrices A and B, where A =

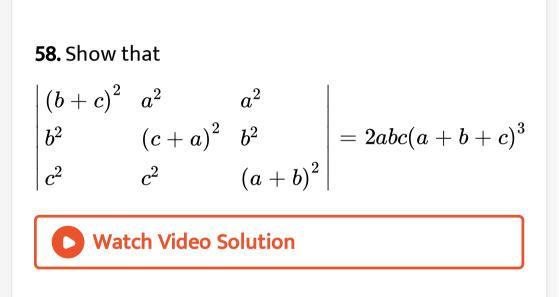
$$\begin{bmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{bmatrix}$$
 and B =
$$\begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$$
 Hence solve the following equations by matrix method,



$$3x + 2y + z = 7,$$

2x + y + 3z = 2.

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59. Find the inverse of the following matrices using

elementary transformation

$$egin{bmatrix} 3 & -2 & 3 \ 2 & 1 & -1 \ 4 & -3 & 2 \end{bmatrix}$$

60. If
$$x = a \cos \theta + b \sin \theta$$
 and $y = a \sin \theta - b \cos \theta$,
then show that $y^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = 0$
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61. Find the equation of the normal at a point on the curve $x^2 = 4y$, which passes through the point

(1, 2). Also, find the equation of the corresponding

tangent.



62. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the straight line $\frac{x}{a} + \frac{y}{b} = 1$

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63. Prove analytically : The perpendicular bisector of

the sides of a triangle are concurrent.

