



# MATHS

# **BOOKS - SHARAM PUBLICATION**

# **MODEL QUESTION PAPER-5**

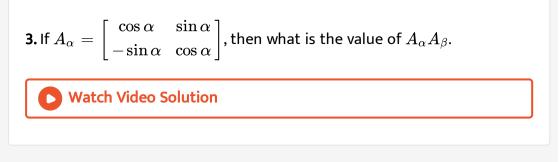


1. For the binary operation a \* b = 3a + 2b for  $a, b \in Z$  test whether it is

associative.

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**2.** What is the principal value of 
$$an^{-1} \left( an \left( \frac{2\pi}{4} \right) \right)$$
?



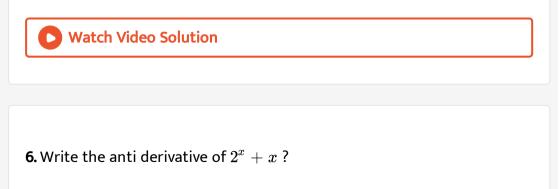
4. If  $\omega$  is a complex cube root of 1,then for what value of. lamda the

 $egin{array}{ccc} {\sf determinant} egin{array}{ccc} 1 & \omega & \omega^2 \ \omega & \lambda & 1 \ \omega^2 & 1 & \omega \end{array} egin{array}{ccc} = 0 \ ? \end{array}$ 

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5. Write interval in which the function  $f(x) = \sin^{-1}(3-x)$  is differentiable.



7. Form the differential equation from  $y = a \cos ecx$  by elliminating the arbitrary constant.

**8.** If 
$$f(x) = \sqrt{x}$$
 and  $g(x) = rac{x}{4}$  then what is (g of) (x).?

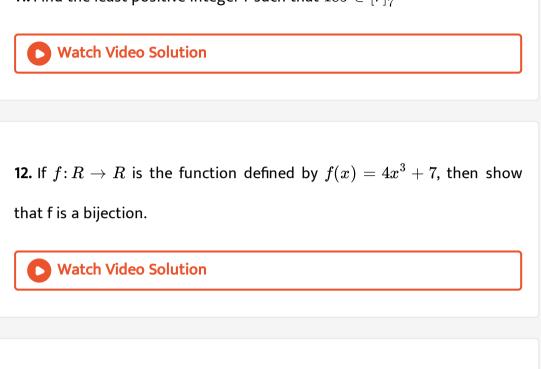
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9. Write the angle between  $\overrightarrow{a}$  and  $\overrightarrow{b}$  with magnitude  $\sqrt{5}$  and 2 respectively having  $\overrightarrow{a}$ .  $\overrightarrow{b} = \sqrt{10}$ .

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10. Write the distance of the plane 3x - 4y + 12z = 3 from the origin.

11. Find the least positive integer r such that  $185 \in [r]_7$ 



**13.** if \* is the binary operation on N given by a \* b = L. C. M of a and b. Find 20 \* 16. Is \* Commutative.

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14. Show that 
$$2 \tan^{-1}\left(\frac{1}{4}\right) + 2 \tan^{-1}\left(\frac{2}{9}\right) = \tan^{-1}\left(\frac{4}{3}\right).$$

**15.** Prove that  

$$\begin{vmatrix} 1+a & 1 & 1\\ 1 & 1+b & 1\\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$
 or  $(abc+bc+ca+ab)$   
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**16.** Prove that 
$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$
 = (a-b)(b-c)(c-a)(a+b+c).

17. If 
$$A = egin{bmatrix} -1 & 3 & 5 \ 1 & -3 & -5 \ -1 & 3 & 5 \end{bmatrix}$$
 then show that  $A^2 = 9A$ 

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**18.** If  $\begin{bmatrix} x+y & x-2\\ 2x-y & 0 \end{bmatrix} = \begin{bmatrix} 2 & 2\\ 1 & 0 \end{bmatrix}$  then find the values of x,y?

19. Show that 
$$(a+1)$$
 is a factor of  $egin{array}{ccc} (a+1) & 2 & 3 \ 1 & a+1 & 3 \ 3 & -6 & a+1 \ \end{array}$ 

20. Find the value of a such that the function f defined by

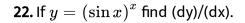
$$f(x) = egin{cases} rac{\sin ax}{\sin x} & ext{if} \;\; x 
eq 0 \ rac{1}{a} & ext{if} \;\; x = 0 \end{cases}$$

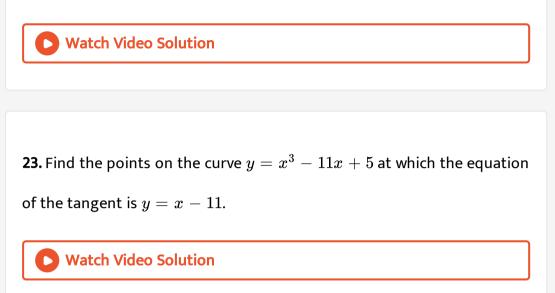
is continuous at x=0.

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## 21. Differentiate

$$an^{-1}rac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}$$





**24.** Evaluate 
$$\int \frac{x}{(x^2+4)} dx.$$

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

**26.** Evaluate 
$$\int \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$$

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



**28.** If the sum of two unit vectors is a unit vectors find the magnitude of their difference.

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29. Find a vector of magnitude 5 units and parallel to the resultant of

$$\overrightarrow{a}=2\hat{i}+3\hat{j}-\hat{k}$$
 and  $\overrightarrow{b}=\hat{i}-2\hat{j}+\hat{k}.$ 

**30.** Show that 
$$\begin{bmatrix} \overrightarrow{a} + \overrightarrow{b} \overrightarrow{b} + \overrightarrow{c} \overrightarrow{c} + \overrightarrow{a} \end{bmatrix} = 2 \begin{bmatrix} \overrightarrow{a} \overrightarrow{b} \overrightarrow{c} \end{bmatrix}$$

**31.** Find the equation of the plane through the points (1, 2, -3), (2,3, -4)

and perpendicular to the plane x + y + z + 1 = 0.



**32.** If p is a prime and  $ab \equiv 0 \pmod{p}$  then show that either a=0 (mod p)

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or b \equiv 0 \pmod{p}.
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33.

$$\sin^{-1}\Bigl(rac{x}{a}\Bigr)+\sin^{-1}\Bigl(rac{y}{b}\Bigr)=lpha$$
 prove that  $rac{x^2}{a^2}+rac{2xy}{ab}{
m cos}lpha+rac{y^2}{b^2}=\sin^2lpha$ 

If

**34.** Using properties of determinants, prove the following  $\begin{vmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2.$ 

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**35.** Find the tangent to the curve  $y = \cos(x+y), 0 \le x \le 2\pi$  which is

parallel to the line x + 2y = 0

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36. 
$$\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\cot x}}$$

**37.** Solve the differential equation 
$$ig(x^2+1ig)rac{dy}{dx}+2xy=\sqrt{x^2+4}$$
,



**38.** Find a unit vector perpendicular to both of the vectors  $\overrightarrow{a} + \overrightarrow{b}$  and  $\overrightarrow{a} + \overrightarrow{b}$  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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**39.** Find the equations of the plane passing through the point (2, 1, 3)

and perpendicular to the lines 
$$\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$$
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