



## MATHS

### BOOKS - SHARAM PUBLICATION

### QUESTION PAPER 2011

#### Exercise

1. Differentiate  $\sin^{-1}(\cos x)$  with respect to  $x$ .



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2. If  $f(x, y) = \frac{x - y}{x + y}$  then write the degree of the homogenous function  $\frac{df}{dy}$ .

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3. Write the value of  $df$ , if  $f(x) = \ln(1 + x)$ ,  $x = 1$  and  $\Delta x = 0.04$ .

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4. Write the equation of the tangent to the curve  $y = |x|$  at the point  $(-2, 2)$ .

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5. Which condition of Rolle's theorem is violated by the function  $f(x) = \sin x$  in  $\left[0, \frac{3\pi}{4}\right]$

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6.  $\int \frac{\cot x dx}{\ln \sin x} = ?$

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7. What is  $F'(x)$  if  $F(x) = \int_0^x e^{2t} \sin 3t dt$ ?

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8. Integrate  $\int \frac{dx}{\cos^2 x \cdot \sin^2 x}$

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9. Write the order of the differential equation whose general solution is  $y = ax^2 + b$ , where  $a$  and  $b$  are arbitrary constants.

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10. Write the particular solution of the equation

$$\frac{dy}{dx} = \sin x \text{ for which } y = 1 \text{ when } x = \pi.$$

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11. Write a vector normal to  $\hat{i} + \hat{k}$  and  $\hat{i} + \hat{j}$ .

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12. Write the values of  $m$  and  $n$  for which the vectors  
 $(m - 1)\hat{i} + (n + 2)\hat{j} + 4\hat{k}$  and  
 $(m + 1)\hat{i} + (n - 2)\hat{j} + 8\hat{k}$  will be parallel.

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13. How many independent constants are there in the general equation of a plane  $ax + by + cz + d = 0$  ?



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14. Determine the values of  $a, b$  and  $h$  for which the equation

$$ax^2 + 2hxy + by^2 + 3z^2 - 4x - 6y - 4 = 0$$

represents a sphere.



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15. Write the maximum value of  $x + y$  subject to

$$2x + 4y \leq 6, x \geq 0, y \geq 0.$$



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16. Write the value of  $k$ , if

$$\begin{vmatrix} aa_1 & aa_2 & aa_3 \\ ab_1 & ab_2 & ab_3 \\ ac_1 & ac_2 & ac_3 \end{vmatrix} = k \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$



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17. if  $A$  is a  $3 \times 3$  matrix and  $|A| = 3$ , then write the matrix represented by  $A \times adjA$ .

A. .

B.

C.

D.

**Answer:**



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**18. Find r if:  $16P(15,r) = 13P(16,r)$**



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19. Determine the middle term in the expansion of

$$\left(\frac{1}{3}a + \frac{1}{3}b\right)^8.$$



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20. A bag contains 7 white and 9 black balls. If a ball is drawn at random, what is the probability that it is white?



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21. Find  $\frac{dy}{dx}$  if  $y = \log \tan^{-1} x + e^{2x}$ .



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22. Find  $\frac{dy}{dx}$  if  $y = 10^{\ln \sin x}$

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23. Evaluate  $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x)$

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

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25. State Cauchy's mean value theorem.

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26. Integrate:  $\int (e^{2x} - 4x^3) dx$

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27. Find by integration the area bounded by the straight lines  $y = 0$ ,  $y = x$  and  $x + 2y = 3$ .

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28. Evaluate:  $\int_0^4 \sqrt{x} dx$



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29. Reduce the following to a linear differential equation  $x \frac{dy}{dx} + y = xy^2$ .



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30. Write the integrating factor of the differential equation  $(x - \ln y) \frac{dy}{dx} = -y \ln y$



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31. Solve  $\frac{dy}{dx} = \frac{y^2}{xy - x^2}$ .

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32. Resolve the vector  $\vec{b} = \hat{i} + \hat{j} + \hat{k}$  into vectors parallel and perpendicular to the vector  $\vec{a} = \hat{i} + \hat{j}$ .

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33. Find the area of the parallelogram whose diagonals are vectors  $3\hat{i} + \hat{j} - 2\hat{k}$  and  $\hat{i} - 3\hat{j} + 4\hat{k}$ .

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**34.** Determine the value of  $m$ , for which the following vectors are orthogonal.

$$(m + 1)\hat{i} + m^2\hat{j} - m\hat{k}, (m^2 - m + 1)\hat{i} - m\hat{j} + \hat{k}$$

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**35.** find the equation to the plane passing through the line  $x=y=z$  and the point  $(-1,3,4)$ .

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**36.** Find the image of the point  $(-2,0,3)$  with respect to the plane  $y = 3$ .

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37. Shade the feasible region for the inequations

$2x + 3y \leq 6$ ,  $x \geq 0$ ,  $y \geq 0$  in a rough figure.

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38. Find  $n$  and  $x$ , given that:

$$(1 + x)^n = 1 + \frac{3}{4} + \frac{(3)(5)}{(4)(8)} + \frac{(3)(5)(7)}{(4)(8)(12)} + \dots \rightarrow \infty$$

.

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**39.** Prove that:

$$A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} \Rightarrow A^2 - 5A + 7I = 0.$$



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**40.** Test whether the following system of equations have non zero solution. Write the solution set.

$$2x + 3y + 4z = 0$$

$$x - 2y - 3z = 0$$

$$3x + y - 8z = 0$$



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41. Two dice are rolled in succession. Find the probability that the first dice shows atmost 3 and the second shows an odd number not less than 3.

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42. A and B are two events. If  $P(A) = \frac{3}{8}$ ,  $P(B) = \frac{1}{2}$  and  $P(A \cap B) = \frac{1}{4}$  then find  $P(A/B)$ .

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43. Prove that  $y = \tan^{-1} \sqrt{\frac{1 + \sin x}{1 - \sin x}} \Rightarrow \frac{dy}{dx} = \frac{1}{2}$

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44.  $x^p y^q = (x + y)^{p+q} \Rightarrow \frac{dy}{dx} = \frac{y}{x}$

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45. Find the following limits:  $\lim_{x \rightarrow 1} \left( \frac{1}{x-1} - \frac{1}{\ln x} \right)$

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46. Find the following limits:  $\lim_{x \rightarrow 1} (2 - x)^{\operatorname{cosec} \pi x}$

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47. Discuss the extreme value of the function

$$y = (x + 2)^4(x - 1)^5$$



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48. Find  $\int x^2(\sin^4 x + \cos^4 x) dx$



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49. Evaluate the following integrals :

$$\int \frac{dx}{(x - 2)\sqrt{x^2 - 16x + 64}}$$



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50. Solve  $(x-y+1)dx-(x+y+5)dy=0$



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51. Prove that

$$\left[ \vec{p} - \vec{q} \vec{q} - \vec{r} \vec{r} - \vec{p} \right] = 0$$



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52.

Prove

that

$$\vec{a} \times \left( \vec{b} \times \vec{c} \right) + \vec{b} \times \left( \vec{c} \times \vec{a} \right) + \vec{c} \times \left( \vec{a} \times \vec{b} \right)$$

= 0 and hence prove that

$$\vec{a} \times (\vec{b} \times \vec{c}), \vec{b} \times (\vec{c} \times \vec{a}), \vec{c} \times (\vec{a} \times \vec{b})$$

are coplanar.



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53. Solve the following LPP graphically : Maximize :

$$Z = 5x_1 + 3x_2 \quad \text{subject to} \quad : \quad 3x_1 + 5x_2 \leq 15$$

$$5x_1 + 2x_2 \leq 10 \quad x_1, x_2 \geq 0$$



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54. Show that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$



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55. Solve by matrix inversion method.

$$x - 2y = 3$$

$$3x + 4y - z = -2$$

$$5x - 3z = -1$$



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