



## MATHS

### BOOKS - SHARAM PUBLICATION

### QUESTION PAPER 2012

#### Exercise

1. Differentiate  $a^{\sin x}$  with respect to  $x$ .

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2. Mention the values of  $x$  for which the function  $f(x) = x^3 - 12x$  is decreasing,

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3. Evaluate:  $\lim_{x \rightarrow 0} \frac{3x - 2 \ln(1 + x)}{x}$

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4. What is  $F'(t)$  if  $F(t) = \int_a^t e^{3x} \cdot \cos 2x dx$ ?

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5. integrate  $\int \frac{3 + \cos x + \tan^2 x}{2x + \sin x + \tan x}$

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6. Write the particular solution of the equation  $\frac{dy}{dx} = \sin x$  given that  $y\left(\frac{\pi}{2}\right) = 2$ .

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7. Write the order and degree of the following differential equation

$$d^2 \frac{y}{dx^2} = 2y^3 + \frac{\left(\frac{dy}{dx}\right)^4}{\sqrt{\frac{d^2y}{dx^2}}}$$

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8. What is the point of intersection of the line  $x = y = z$  with the plane  $x + 2y + 3z = 6$ ?

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9. To which coordinate axis is the plane  $2x + 3z = 0$  parallel ?

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10. Find the component of the vector  $\vec{b} = 8\hat{i} + \hat{j}$  in the direction of the vector  $\vec{a} = \hat{i} + 2\hat{j} - 2\hat{k}$ .

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11. What is the minimum value of  $n$  if  $P(n,2)=90$ ?

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12. What is the probability of getting a total of utmost 11 when two dice are thrown ?

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13. Determine the maximum value of  $\left| \begin{array}{cc} \cos x & \sin x \\ -\sin x & \cos x - 1 \end{array} \right|$ .

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14. Write the solution of the following LPP

$$\text{Maximise } Z = x + y$$

$$\text{Subject to } 3x + 4y \leq 12, x \geq 0, y \geq 0$$

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15. Prove that , if  $y = \log \tan\left(\frac{\pi}{4} + \frac{x}{2}\right)$  , then  $\frac{dy}{dx} = \sec x$

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16. Differentiate with resi to  $x$  :  $Y = 2^{x^2} + \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$

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17. Find  $\left(\frac{dz}{dx}\right)$  if  $z = x^{\cos x}$ .



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18. Evaluate  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\log\left(x - \frac{\pi}{2}\right)}{\tan x}$

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19. Find the equation of tangent to the curve  $x = y^2 - 2$  at the points where slope of the normal equal to (-2).

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20. Integrate:  $\int \frac{\cos 2x}{\cos x + \sin x} dx$

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21. Evaluate:  $\int 2a^{x^2} x dx$

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

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23. Find the solutions of the following differential equations :

$$y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$$

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24. Solve the following differential equations

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

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25. Find a vector  $\vec{b}$  such that  $\vec{a} \times \vec{b} = \vec{c}$  and  $\vec{a} \cdot \vec{b} = 3$ , where

$$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{c} = \hat{j} - \hat{k}.$$

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26. Prove by vector method that in a

$$\Delta ABC, c^2 = a^2 + b^2 - 2ab \cos C.$$

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27. Find the co-ordinates of the point where the perpendicular from the origin meets the line joining the points  $(-9, 4, 5)$  and  $(11, 0, -1)$ .

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28. Solve for  $x$ ,

$$\begin{vmatrix} 15 - 2x & 11 & 10 \\ 11 - 3x & 17 & 16 \\ 7 - x & 14 & 13 \end{vmatrix} = 0$$

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29. If  $A = \begin{bmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{bmatrix}$ , then find  $A^3 - A^2$ .

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30. Find the value of the term free from  $X$  in the expansion of

$$\left( \frac{3}{2}(x^2) - \frac{1}{3x} \right)^9$$

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31.  $A$  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  $P(A^c \cap B^c)$  and  $P(A \cap B^c)$

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32. If  $A$  and  $B$  are independent events, show that

$A^c$  and  $B^c$  are independent,

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33. Evaluate:  $\lim_{x \rightarrow 0} \left( \frac{\sin x}{x} \right)$

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34. Integrate:  $\int \frac{\sin^2 x}{1 + \cos x} (dx)$

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35. Determine:  $\int \sqrt{1 + \sin 2x} dx$

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36. Integrate:  $\int \frac{3x^2}{x^2 + 1} dx$

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

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38. Prove that the four points  $(0, 4, 3)$ ,  $(-1, -5, -3)$ ,  $(-2, -2, 1)$  and  $(1, 1, -1)$  lie in one plane. Find the equation of the plane.

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39. Show that the lines  $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$  and  $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$  are coplaner. Find their point of intersection.

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40. Solve the following LPP graphically Maximize  $z = 20x_1 + 10x_2$

Subject to  $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0$

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41.

Prove

that

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = (x - y)(y - z)(z - x)(xy + yz + zx)$$

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42. Solve by matrix inversion method.

$$x + y + z = 2$$

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

$$x + y - z = 1$$

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