



MATHS

BOOKS - SHARAM PUBLICATION

QUESTION PAPER 2013

Exercise

1. Write the derivation of $e^{3 \log x}$ with respect to x^2 .



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2. Write the maximum value of the function $y = x^5$ in the interval $[1, 5]$.

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3. Write the values of $\int \frac{1 - \sin^3 x}{\sin^2 x} dx$.

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4. Write the degree of the differential equation

$$\text{In} \left(\frac{d^2 y}{dx^2} \right) = y.$$

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5. If the vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$ and $\vec{b} = \alpha\hat{i} - \hat{j} + 2\hat{k}$ are parallel, then $\alpha = \underline{\hspace{2cm}}$



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6. Write the equation of the line passing through the point $(4, -6, 1)$ and parallel to the line $x - \frac{1}{1} = y + \frac{2}{3} = z - \frac{1}{-1}$.



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7. What is the image of the point $(-2, 3, -5)$ respect to the zx -plane ?

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8. Write the matrix which when added to the matrix

$$\begin{bmatrix} 2 & 5 \\ -1 & 3 \end{bmatrix} \text{ gives that matrix } \begin{bmatrix} 5 & 1 \\ 4 & 7 \end{bmatrix}.$$

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9. write the value of $c_1^8 + c_2^8 + \dots + c_8^8$.

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10. If $P(A) = 0.6$, $P(B) = 0.4$ and $P(A \cap B) = 0.2$, then find the value of $P\left(\frac{B}{A}\right)$?

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11. Find the derivative of $\sin x^x$ with respect to x .

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12. Differentiate $\sin^{-1}\left(\frac{2X}{1+X^2}\right)$ with respect to $\cos^{-1}\left(\frac{1-X^2}{1+X^2}\right)$.

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13. Find the slope of the tangent to the curve

$$x=2(t-\sin t) \text{ and } y = 2(1-\cos t) \text{ at } t=\frac{\pi}{4}$$



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14. If $\cos y = x \cos(a+y)$ then prove that

$$\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$$



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15. Find the extreme values of the function

$$y = X + \frac{1}{x}$$

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16. Integrate: $\int \sqrt{1 - \cos 2x} dx$

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17. Integrate: $\int a^{x+2} dx$

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18. Integrate: $\int \frac{\cos x}{\sin^5 x} dx$

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19. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

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20. Solve $\frac{dy}{dx} = e^{2x+3y}$.

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21. Solve $\frac{dy}{dx} + y = e^{-x}$

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22. Find the differential equation whose general solution is $y = a \cos x + b \sin x$.

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23. If $\vec{a} = (2, -2, 1)$, $\vec{b} = (2, 3, 6)$ and $\vec{c} = (-1, 0, 2)$, Find the magnitude and direction of $\vec{a} - \vec{b} + 2\vec{c}$.

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24. Prove the following by vector method. An angle inscribed in a semi-circle is a right angle.

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25. If \vec{a} , \vec{b} and \vec{c} mutually perpendiculars, show

$$\text{that } \left[\vec{a} \cdot \left(\vec{b} \times \vec{c} \right) \right]^2 = a^2 b^2 c^2$$



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26. Show that the points $(3,-2,4)$, $(1,1,1)$ and $(-1,4,-1)$ are collinear.



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27. Find the equation of a plane bisecting the line segment joining $(-1, 4, 3)$ and $(5, -2, -1)$ at right angle.



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28. Find the value of r , if the line

$$\frac{x-1}{1} = \frac{y+2}{3} = \frac{z-1}{-1} = r \text{ intersects the plane}$$

$$2x + y + z = 9.$$



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29. Find equation of the sphere if the line segment joining the Points $(4, 5, 6)$ and $(2, 3, 4)$ is a diameter of the sphere.



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30. Find the maximum value of $z = 50x_1 + 60x_2$ subject to $2x_1 + 3x_2 \leq 6, x_1, x_2 \geq 0$



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31. Find the value of $\begin{vmatrix} 17 & 58 & 97 \\ 19 & 60 & 99 \\ 18 & 59 & 98 \end{vmatrix}$ without expanding.

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32. Prove that the following. $\begin{bmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{bmatrix}$
 $= abc(1+1/a+1/b+1/c)$

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33. Find the product $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ -2 & 3 \end{bmatrix}$

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34. Prove that ${}^{2n}C_0 + {}^{2n}C_2 + \dots + {}^{2n}C_{2n} = 2^{2n-1}$

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35. $C_3^{2n} : C_3^n = 44 : 5$, find the value of n .

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36. In how many ways can 2 boys and 3 girls sit in a row so that no two girls sit side by side?

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37. If 8 person are to sit around a table what is the probability that X and Y don't sit together



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38. A class consists of 25 boys and 15 girls. If a committee of 6 is to be chosen at random, find the probability that are exactly 3 boys in the committee



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39. If $y = e^{ax} \cos bx$ then find $y_n(0)$.



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40. Use the function $f(x) = x^{1/x}$, $x > 0$ to show that $e^\pi > \pi^e$.



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41. Evaluate: $\int_0^1 \frac{\ln(1+x)}{1+x^2} dx$.



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



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43. Obtain the volume of the parallelopiped whose sides are vectors

$$\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}, \vec{b} = \hat{i} + 2\hat{j} - \hat{k}, \vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$$

. Also find the vector $\left(\vec{a} \times \vec{b}\right) \times \vec{c}$.



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44. Solve the matrix inversion method

$$x + 2y + 3z = 8, 2x + y + z = 8 \text{ and } x + y + 2z = 6$$



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45. If $P(A) = 0.4$, $P(B | A) = 0.3$ and $P(B^c | A^c) = 0.2$. find

$P(B)$



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