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MATHS

BOOKS - SHARAM PUBLICATION

MODEL QUESTION PAPER 14

Exercise

1. If $f: R \to R$ and $g: R \to R$ is defined by f(x)=sinx and $g(x) = 5x^2$, then (gof)(x).

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2. If $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$ then what is $\cos^{-1} x + \cos^{-1} y$

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3. Determine the maximum value of $\begin{vmatrix} \cos x \sin x \\ -\sin x \cos x - 1 \end{vmatrix}$.

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4. If A is a 4×5 matrix and B is a matrix such that $A^T B$ and BA^T both are defined, then write the

order of B.

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5. What is the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$?

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6. What is thevalue of a for which the function $f(x) = a\sin x + \frac{1}{3}\sin 3x$ hasan extremum at $x = \frac{\pi}{3}$?

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

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8. Form the differential equation , whose solution is

$y = e^{x+a}$

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9. If $\left(\vec{a} \times \vec{b}\right)^2 + \left(\vec{a} \cdot \vec{b}\right)^2 = 144$, write the value of ab.

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10. What are the direction consines of the normal to the plane $3x - 2y - 2z + 1 = 0$?

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11. 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.

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12. Prove the $\sin^2\left(\sin^{-1}x+\sin^{-1}y+\sin^{-1}z\right)$

$=\cos^2\left(\cos^{-1}x+\cos^{-1}y+\cos^{-1}z\right)$

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13. Solve for x

$\tan^{-1}(x+2)+\tan^{-1}(x-2)=\tan^{-1}\left(\frac{8}{79}\right), x>0$

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14. Solve the following LPP graphically

Maximize, $Z = 20x + 30y$

Subject to $3x + 5y \leq 15$

$x, y \geq 0.$

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15. Find x, so that $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = O$

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16. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then prove that $A^2 - 4A - 5I = 0$.

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17. Prove that: $\begin{vmatrix} 1 & a & a^2 \\ a^2 & 1 & a \\ a & a^2 & 1 \end{vmatrix}$ is a perfect square.

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18. Solve for x,

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

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19. If sin y = x sin (a + y) then show that

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

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20. If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t)$, then find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$.

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21. Find the equation of tangent to the curve $x^2 + 3y = 3$ which is parallel to y - 4x + 5 = 0

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22. Find the extreme values of the function $y = X + \frac{1}{x}$.

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23. $\int_0^1 \frac{x^5(4-x^2)}{\sqrt{1-x^2}}dx$

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24. Integrate the following $\int \frac{\sec^2\sqrt{x}}{\sqrt{x}}dx$

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25. $\int x^2 \tan^{-1} x dx$

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

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27. Using vector method find the area of the triangle with vertices (1, 0, 0) (0, 1, 0) and (0, 0, 1)

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28. Find $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ when $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$, $\vec{c} = \hat{j} + \hat{k}$

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29. Find the image of the point $(2, -1, 3)$ in the plane $3x - 2y + z - 9 = 0$

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30. Find the point where the line $\frac{x-2}{1} = \frac{y}{-1} = \frac{z-1}{2}$ meets the plane $2x + y + z = 2$.

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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.

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

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33. If $\sin^{-1}\left(\frac{x}{a}\right)+\sin^{-1}\left(\frac{y}{b}\right)=\sin^{-1}\left(\frac{c^2}{ab}\right)$, then prove that

$b^2x^2+2xy\sqrt{a^2b^2-c^4}+a^2y^2=c^4$

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34. Solve the following LPP graphically Maximize

$z=5x_1+3x_2$

Subject to

$3x_1+5x_2\leq 15, 5x_1+2x_2\leq 10, x_1, x_2\geq 0.$

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35. 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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36. Examining consistency and solvability, solve the following equation by matrix method.

x+y+z=4

2x-y+3z=1

3x+2y-z=1

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37. Find the point on the curve $y^2 - x^2 + 2x - 1 = 0$ where the tangent is parallel to the x-axis.

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38. Find the maximum of the function $f(x) = \left(\frac{1}{x}\right)^x$

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

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40. solve: $\left(1+y^2\right)xdx+\left(1-x^2\right)ydy=0$

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41. Prove that the two lines whose direction cosines are connected by the equations $l+2m+3n=0, 3lm-4\ln+mn=0$ are perpendicular to each other.

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