MATHS

BOOKS - ARIHANT PRAKASHAN

VERY SIMILAR TEST 6

Section A Answer All The Questions

1. Prove that $f(x) = \frac{3}{x} + 7$ is strictly decreasing for $x \in R, (x \neq 0)$.

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2. Evaluate $\int (ax + b)^3 dx$

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3. Find the integrating factor of the differential equation $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right)\frac{dx}{dy} = 1.$

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4. Find λ and μ if $\left(2\hat{i} + 6\hat{j} + 27\hat{k}\right) \times \left(\hat{i} + \lambda\hat{j} + \mu\hat{k}\right) = \vec{0}.$

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5. How many straight lines in space through the origin are equally inclined to the coordinate axes?

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6. Let be a binary operation defined by a*b = 7a+9b. Find 3*4.

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7. Evaluate $\sin\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$.

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8. Prove the following : $\begin{bmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{bmatrix}$ =0

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9. For the following probability distribution

X	1	2	3	4
P(X)	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

Find $E(X^2)$.

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10. Differentiate the function $\tan(x^2+5)$

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Section B Answer Any Three Questions

1. Prove that $\cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)=\frac{x}{2}, 0<x<\frac{\pi}{2}, \text{ or } x \in \left(0, \frac{\pi}{4}\right)$

.

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2. Solve the following LPP graphically.

Maximize $z=4x_1+3x_2$

$x_1+2x_2 \leq 80, 2x_1+x_2 \geq 20 \text{ and } x_1, x_2 \geq 0$

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3. Show that the relation R on the set Z of integers given by R = {(a,b): 2 divides (a - b)} is an equivalence relation.

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4. Show that the function $f: R \to R$ defined by $f(x) = \frac{x}{x^2+1}$ is neither one-one nor onto.

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5. Solve for x, $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\frac{8}{31}[0 < x < 1]$.

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6. If P(A)=0.8 P(B)=0.5 and $P\left(\frac{B}{A}\right)$ =0.4 then find the value of $P(A \cup B)$

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7. Find the inverse of the following matrices using elementary transformation

$$\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$$

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8. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then prove that $A^2 - 5A + 7I = O$

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9. Prove that the following.

$$\begin{vmatrix} (v+w)^2 & u^2 & u^2 \\ v^2 & (w+u)^2 & v^2 \\ w^2 & w^2 & (u+v)^2 \end{vmatrix} = 2uvw(u+v+w)^3$$

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10. Find the mean and the variance of the number obtained on a throw of an unbiased coin.

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11. Find the equation of the tangent and normal to the curve $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at the point $\left(\sqrt{2}a, b\right)$.

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12. Find the local maximum and local minimum values of the function $f(x) = \frac{4}{x+2} + x$.

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13. If $\log \sqrt{x^2 + y^2} = \tan^{-1}\left(\frac{x}{y}\right)$, then show that $\frac{dy}{dx} = \frac{y-x}{y+x}$.

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14. If $e^{y/x} = \frac{x}{a+bx}$ then show that $x^3 \frac{d}{dx}\left(\frac{dy}{dx}\right) = \left(x\frac{dy}{dx} - y\right)^2$

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15. Verify, MVT, if $f(x) = x^2 - 4x - 3$ in the interval [a,b], where a =1 and b=4.

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16. Find the solution of the differential equation $\frac{dy}{dx} + y = \cos x - \sin x.$

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17. Solve $\frac{dy}{dx} + 2y \tan x = \sin x$, if $y\left(\frac{\pi}{3}\right) = 0.$

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18. Evaluate $\int \frac{dx}{e^{4x} - 5}$

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19. Evaluate $\int_1^2 \left(4x^3 - 5x^2 + 6x + 9\right) dx$

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20. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$ divide the area of the square bounded by $x = 0, x = 4, y = 4$ and $y = 0$ into three equal parts.

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21. Find the vector equation of the plane which contains the line of intersection of the planes $r\left(\hat{i} + \hat{j} + \hat{k}\right) = 6$ and $r.\left(2\hat{i} + 3\hat{j} + 4\hat{k}\right) = -5$ and the point $(1, 1, 1)$.

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22. Prove that the lines $\frac{x-2}{1}=\frac{y-4}{4}=\frac{z-6}{7}$ and $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ are coplanar.

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23. Prove that $\left(\vec{a}\times\hat{i}\right)^2+\left(\vec{a}\times\hat{j}\right)^2+\left(\vec{a}\times\hat{k}\right)^2=2\vec{a}^2$.

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24. Prove that the sum of the vectors represented by the sides of a closed polygon taken in order is a zero vector.

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Section C Answer Any One Questions

1. If $y = \cos^{-1}\left[\frac{2x - 3\sqrt{1-x^2}}{13}\right]$ then find $\frac{dy}{dx}$

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2. Show that the semivertical angle of a cone of given slant height is $\tan^1\sqrt{2}$ when its volume is maximum.

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3. Find the area between the curve $y^2 = 4x$ line $x + y = 3$ and Y-axis.

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4. Find the solution of the following differential equations:

(2x+3y-5)dy/dx+3x+2y-5-0

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5. Evaluate $\int_0^4 (x + e^{2x})\,dx$, as limit of sum.

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6. Find the equation of the plane through the intersection of the planes $\vec{r}.\left(\hat{i} + 3\hat{j}\right) - 6 = 0$ and $\vec{r}.\left(3\hat{i} - \hat{j} - 4\hat{k}\right) = 0$, whose perpendicular distance from origin is unity.

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7. If $\cos^{-1}\left(\frac{x}{a}\right) = \cos^{-1}\left(\frac{y}{b}\right) = \theta$, prove that $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\theta + \frac{y^2}{b^2} = \sin^2\theta$.

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8. Prove that for any $f: X \to Y$, $foid_x = f = id_Y$ of.

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9. Solve the following system of equations by the matrix inversion method

$x + y + z = 4$

$2x - y + 3z + 1$

$3x + 2y - z = 1$

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10. The probability that a student securing first division ia an examination is $\frac{1}{10}$. What is the probability that out of 100 students twenty pass in first division ?

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11. Find the inverse of the following matrix using elementary transformation : $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$

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