MATHS

BOOKS - ARIHANT PRAKASHAN

VERY SIMILAR TEST 2

Section A

1. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \ldots \infty}}}$, then find $\frac{dy}{dx}$.

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2. Write the equation of tangent drawn to the curve $y = \sin x$ at the point (0,0) .

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3. Intergrate $\int e^{e^{e^x}} e^{e^x} e^x dx$.

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4. Write the order and degree of the differential equation in $\frac{d^2y}{dx^2} = y$

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5. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = 3\hat{i} + 4\hat{j}$, $\vec{b} = -5\hat{i} + \lambda\hat{j}$.

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6. The projection of a line segment $\overline{OP}$, through origin O, on the co-ordinate axes are 6, 2, 3. Find the length of the line segment OP and its direction cosines.

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7. Find the value of $\begin{vmatrix} \cos^2\alpha & \sin^2\alpha+1 & 1 \\ \cos^2\beta & \sin^2\beta+1 & 1 \\ \cos^2\gamma & \sin^2\gamma+1 & 1 \end{vmatrix}$

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8. If events A and B are not mutually exclusive and $P\left(\frac{A}{B}\right)=P\left(\frac{B}{A}\right)$ then prove that P(A)=P(B)

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9. If $R=\{(x,y):x+2y=8\}$ is a relation on N, then write the range of R.

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10. Write the value of $\cos^{-1}\left(-\frac{1}{2}\right)+2\sin^{-1}\left(\frac{1}{2}\right)$.

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Section B

1. Prove that $\tan^{-1}\left(\frac{6x-8x^3}{1-12x^2}\right)-\tan^{-1}\left(\frac{4x}{1-4x^2}\right)=\tan^{-1}2x, |2x|<\frac{1}{\sqrt{3}}$.

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2. Find the feasible region of the following system

$2x+y\geq 6, x-y\leq 3, x\geq 0, y\geq 0$

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3. Consider the binary operation $* : R \times R \to R$ and $o : R \times R \to R$ defined as $a * b = |a - b|$ and $aob = a$. For all $a, b \in R$. Show that * is commutative but not associative, .o. is associative but not commutative.

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4. If the function'f : R $\to$ R is given by f(x) = $x^2 + 2$ and g:R $\to$ R is given by g(x) = $\frac{x}{x-1}$, $x \neq 1$ then find fog and gof and hence find fog (2) and gof (-3) .

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5. Solve for x, $2\tan^{-1}(\cos x) = \tan^{-1}(2\text{cosec}x)$.

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6. Factorize the following. $\begin{bmatrix} x & 2 & 3 \\ 1 & x+1 & 3 \\ 1 & 4 & x \end{bmatrix}$

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7. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ is a matrix satisfying AA=9I, then find the values of x and y.

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8. If $A = [a_{ij}]$ is a square matrix such that $a_{ij} = i^2 - j^2$, then check whether A is symmetric or skew -symmetric matric .

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9. If $A(x_1, y_1)$, $B(x_2, y_2)$, and, $C(x_3, y_3)$ are vertices of an equilateral triangle whose each side is equal to a, then prove that

$$\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2 = 3a^4.$$

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10. A random variable X has following probability distribution .

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find k

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11. A random variable X has following probability distribution .

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find

$P(X < 3)$

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12. A random variable X has following probability distribution .

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find

$P(X > 6)$

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13. A random variable X has following probability distribution .

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find

$P(0 < X < 3).$

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14. If $x = \sqrt{a^{\sin^{-1}t}}$, $y = \sqrt{a^{\cos^{-1}t}}$, then show that $\frac{dy}{dx} = -\frac{y}{x}$.

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15. Find the extreme points of the function $f(x) = x^2\sqrt{1-x^2}$. Also , find the extreme values,

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16. Verify the LMVT for the function $f(x) = \frac{1}{4x-1}, 1 \leq x \leq 4.$

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17. Using differentials, find approximate value

$(255)^{1/4}$

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18. Find the equations of all lines having slope -1, that are tangent to the curve $y = \dfrac{1}{x-1}$, $x \neq 1$.

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19. Evaluate $\displaystyle\int \frac{1}{\sqrt{8+3x-x^2}}dx$.

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20. Evaluate $\displaystyle\int_0^{\pi/4} \tan^5 x dx$.

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21. Find the area enclosed by the ellipse $\dfrac{x^2}{16} + \dfrac{y^2}{9} = 1$.

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22. Form the differential equation of the family of circles having centre on Y -- axis and radius 3 units.

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23. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then prove that $\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$.

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24. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors such that $|\vec{a}|=5, |\vec{b}|=12, |\vec{c}|=13$ and $\vec{a}+\vec{b}+\vec{c}=0$ then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

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25. If $\vec{a}, \vec{b}$ are unit vectors such that the vector $\vec{a} + 3\vec{b}$ is perpendicular to $7\vec{a} - 5\vec{b}$, then find the angle between $\vec{a}$ and $\vec{b}$.

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26. Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-3}{4}$.

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27. Passing throughthe point $(2, -3, 1)$ and $(-1, 1-7)$ and perpendicular to the plane $x - 2y + 5z + 1 = 0$.

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Section C

1. Find the value of k, so that the function defined by $f(x) = \begin{cases} kx + 1, & \text{if } x \leq \pi \\ \cos x, & \text{if } x > \pi \end{cases}$ is continuous at $x = \pi$.

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2. Prove that the area of right angled triangle of given hypotenuse is maximum when the triangle is isoceles.

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3. Evaluate the following integrals :

Evaluate $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x}$

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4. Using integration , find the area of triangle formed by the lines $y = x + 3, 2y + 5x = 34$ and $4y + 3x = 26$.

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5. Solve the following differential equation . $\left(x^3 + x^2 + x + 1\right)\frac{dy}{dx} = 2x^2 + x$, given y=1 , when x=0.

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6. Find the image of the point (1,6,3) on the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Also , write the equation of the line joining the given points and its image and find the length of segment joining given points and its image.

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7. Find the inverse of $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -1 \\ 2 & 1 & 0 \end{bmatrix}$ using elecmentary operation.

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8. IF a,b and c are real numbers and $\Delta = \begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$

show that either $a+b+c=0$ or $a=b=c$

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9. Suppose x has a binomial distribution $B\left(6, \frac{1}{2}\right)$ show that x =3 is the most likely outcome

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10. Consider $f: R_+ \to [-5, \infty)$ given by

$f(x) = 9x^2 + 6x - 5$. Show that f is invertible with

$f^{-1}(y) = \left(\frac{\sqrt{y+6}-1}{3}\right)$. Hence , find

$f^{-1}(10)$

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y if $f^{-1}(y) = \frac{4}{3}$ where R_+ is the set of all non negative real number

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12. 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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13. Maximise $Z = x + 2y$

Subject to $x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$and $x \geq 0$, $y \geq 0$.

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