MATHS

BOOKS - ARIHANT PRAKASHAN

VERY SIMILAR TEST 4

Section A

1. Differentiate $\tan^{-1} x$ w.r.t. $\cot^{-1}$ x

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2. Obtain a differential eqution that should be satisfied by the family of concentric circles $x^2 + y^2 = a^2$.

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3. In a race, the probabilities of A and B winning the race are $\frac{1}{3}$ and $\frac{1}{6}$ respectively. Find the probability of neither of them winning the race.

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4. What is the area bounded by $y = x$, $y = 0$, y=0 and $x = 1$?

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5. Find the cross product of vectors $\hat{i} - 2\hat{j} + \hat{k}$ and $4\hat{i} - 4\hat{j} + 7\hat{k}$

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6. If the area of circle increasing at a uniform rate, then prove that perimetre varies inversely as the radius.

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7. Check whether the line $\frac{x-1}{2}=\frac{y-1}{2}=\frac{z-1}{2}$ passes through (0,0,0)

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8. If $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$, then find A^2+2A

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9. Show that the relation R on the set {1,2,3) given by R={(1,1), (2, 2), (3, 3), (1, 2), (2, 3)) is reflexive but neither symmetric nor transitive.

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10. What is a constraint in a linear programming problem ?

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Section B

1. If $\tan^{-1}\left(\frac{x-2}{x-4}\right)+\tan^{-1}\left(\frac{x+2}{x+4}\right)=\frac{\pi}{4}$, then find ther value of x.

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2. If the function f:$[1, \infty) \to [1, \infty)$ defined by f(x) = $2^{x(x-1)}$ is invertible, then find f^{-1} (x).

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3. Two tailors P and Q earn ₹ 150 and ₹ 200 per day respectively. P can stitch 6 shirts and 4 trousers a day, while Q can stitch 10 shirts and 4 trousers per day. How many days should each work to produce atleast 60 shirts and 32 trousers at minimum labour cost ?

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4. Show that the relation is congruent to on the set all triangles in a plane is an equivalence relation

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5. If $\sin^{-1} x + \tan^{-1} x = \frac{\pi}{2}$, then prove that $2x^2 + 1 = \sqrt{5}$

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6. For the matrices A and B, verify that (AB) =B'A', where $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$ and $B = [-1 \quad 2 \quad 1]$.

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7. If $A = \begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$, then show that $|AB| = |A||B|$

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8. A can hit a target 4 times out of 5 times, B can hit the target 3 times out of 4 times and C can hit the target 2 times out of 3 times. They fire simultaneously. Find the probability that any two out of A, B and C will hit the target.

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9. Find A^{-1}, if $A = \begin{bmatrix} 2 & 4 \\ 1 & 7 \end{bmatrix}$

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10. A fair die is rolled consider the following events A={2,4,6} ,B={4,5} and C={3,4,5,6} Find

$P(A \cup B / C)$

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12. If $y = a\sin x + b\cos x$, then prove that $\frac{d^2y}{dx^2} + y = 0$

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13. Check whether Lagrange.s mean value theorem is applicable to

$f(x) = x^{\frac{1}{3}},\ -1 < x < 1$

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14. Find the point on the curve,$y = 2x^2 - 6x - 4$ at which the tangent is parallel to x-axis

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15. Using differentials, find approximate value

$(255)^{1/4}$

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16. If $f(x) = \begin{cases} \frac{1-\cos 4x}{x^2} & when x < 0 \\ a & when x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}+4} & when x > 0 \end{cases}$. is continuous at x=0, then the value of a will be.

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17. Find $\int x^2 e^x dx$

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18. Find the particular solution of the differential equation log $\left(\frac{dy}{dx}\right) = 3x + 4y$, given that y = 0 when x = 0

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19. Find the general solution of the differential equation $\frac{dy}{dx} = y \tan x - y^2 \sec x$

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20. Find the area between X - axis and the curve y = sin x from x = 0 to x = 2π

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21. Evaluate $\int_0^1 e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx$

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22. Given that , $\left|\vec{a}\right| = 1$ and $\left|\vec{b}\right| = 1$ and $\left|\vec{a} + \vec{b}\right| = \sqrt{3}$. If $\vec{c}$ is a vector such that $\vec{c} - \vec{a} - 2\vec{b} = 3\left(\vec{a} \times \vec{b}\right)$, then find the value of $\vec{c} \cdot \vec{b}$

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23. Find the distance of the point $(1, -2, 3)$ from the plane $x - y + z = 5$, measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$

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24. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three non-coplanar vectors and $\vec{r}$ is only arbitrary vector, then find the value of $\left[\vec{b}\,\vec{c}\,\vec{r}\right]\vec{a}+\left[\vec{c}\,\vec{a}\,\vec{r}\right]\vec{b}+\left[\vec{a}\,\vec{b}\,\vec{r}\right]\vec{c}$

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25. Find the image of the point A (1,0,0) in the line $\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+10}{8}$

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

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Section C

1. Defferentiate

$$\sec^{-1}\left(\frac{1}{2x^2-1}\right) w.r.t. \sqrt{1-x^2}$$

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2. Show that $\sin^P\theta\cos^q\theta$ attains a maximum value, when $\theta = \tan^{-1}\sqrt{\frac{p}{q}}$.

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3. Evaluate $\int_0^{\pi} \frac{x}{a^2\cos^2 x + b^2\sin^2 x}dx$

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4. Find the area of the region {(x,y) : $y^2 \leq$ 6 ax and $x^2 + y^2 \leq 16a^2$} by using integration

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5. Solve the differential equation

$$x\left(x^2 - x^2y^2\right)dy + y\left(y^2 + x^2y^2\right)dx = 0$$

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6. Find the image of a point having position vector $\left(3\hat{i} - \hat{j} + \hat{k}\right)$ in the plane $\vec{r} \cdot \left(3\hat{i} + \hat{j} + 4\hat{k}\right) = 2$

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7. Prove that by vector methord, in any $\Delta ABC, \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}.$

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8. If $f: R \to R$ is given by $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right)$ and $g: R \to R$ is such g (5/4) = 1 . Show that go f : $R \to R$ is a constant function

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9. Solve for x,

$\tan^{-1}(x-1) + \tan^{-1} x + \tan^{-1}(x+1) = \tan^{-1} 3x.$

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10. Solve that following LPP graphically . Maximise : Z = 22 x + 18 y

subject to : $x + y \leq 20, 3x + 2y \leq 48, x \geq 0, y \geq 0$

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11. If x,y,z are positive and are the pth, qth and rth terms of a G.P.

then prove that

$$\begin{vmatrix} \log x & p & 1 \\ \log y & q & 1 \\ \log z & r & 1 \end{vmatrix} = 0$$

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12. If A = $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ find k

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13. Three cards are drawn successively with replacement from a well-shuffled deck of 52 cards. If getting a card of spade is a success, then find the probability distribution of number of successes

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