MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

ANNUAL EXAMINATION QUESTION PAPER MARCH 2017
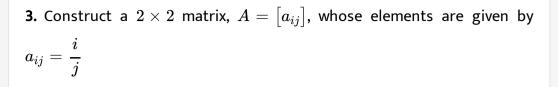
Part A

1. Let * be a binary operation on N defined by $a * b = LCM$ of a and b.

Find $20 * 16$.

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2. Find the principal value of $\csc^{-1}\left(-\sqrt{2}\right)$.

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3. Construct a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = \dfrac{i}{j}$

4. If a square matrix with $|A| = 8$ then find the value of $|A\ A'|$.

5. If y=cos $\sqrt{x}$, find $\dfrac{dy}{dx}$

6. Find : $\displaystyle\int \left(\sqrt{x} + \dfrac{1}{\sqrt{x}} \right) dx.$

7. Define collinear vectors.

8. Find the direction cosines of a line which makes equal angles with the coordinate axes.

9. Define feasible region in a linear programming Problem.

10. If A and B are independent events,$P(A)\dfrac{3}{5}$ and $P(B) = \dfrac{1}{5}$ then find $P(A \cap B)$.

1. If $f: R \rightarrow R$, defined by $F(x) = 1 + x^2$, then show that f is neither 1 - 1 nor onto.

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2. Prove the following:
$$\sin^{-1}\left(2x\sqrt{1 - x^2}\right) = 2\cos^{-1}x, \quad -\frac{1}{\sqrt{2}} \le x \le \frac{1}{\sqrt{2}}$$

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3. If $\tan^{-1}\left(\frac{1 - x}{1 + x}\right) = \frac{1}{2}\tan^{-1}x, x > 0$ find x

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4. Find the value of k,if area of triangle is 4 sq. units and vertices arw (k,0), (4,0) and(0,2) using determinant.

5. If $ax + by^2 = \cos y$ find $\dfrac{dy}{dx}$.

6. Verify Rolle's theorem for the function $f(x) = x^2 + 2x - 8, x \in [-4, 2]$.

7. Find the approximate change in the valume of a cube of side x metres caused side by 3%.

8. Intergrate $\dfrac{\tan^4 \sqrt{x}\, \sec^2 \sqrt{x}}{\sqrt{x}}$ with respect to x.

9. Evaulate $\displaystyle\int_0^{2/3} \dfrac{dx}{4 + 9x^2}$

10. Find the order and degree of the differential equation $\left(\dfrac{dy}{dx}\right)^2 + \dfrac{dy}{dx} - \sin^2 y = 0.$

11. Find the position vectors of a point R which divides the line joining two points P and Q whose position vectors are

$\hat{i} + 2\hat{j} - \hat{k} -$ and $-\hat{i} + \hat{j} - \hat{k}$ respectively, in the ration $2:1$. (i)

Internally, (ii) Externally.

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12. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

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13. Find the vector and the Cartesian equation of the line that passes through the points (3,-2,-5), (3,-2,6).
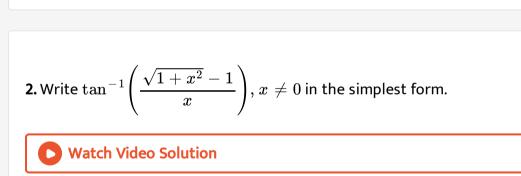
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14. Find the probability distribution of number of heads in two tosses of a coin .

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1. Show that the relation R in R (set of real numbers) is defined as R= $\{(a, b), a \leq b\}$is reflexive and transitive but not symmetric.
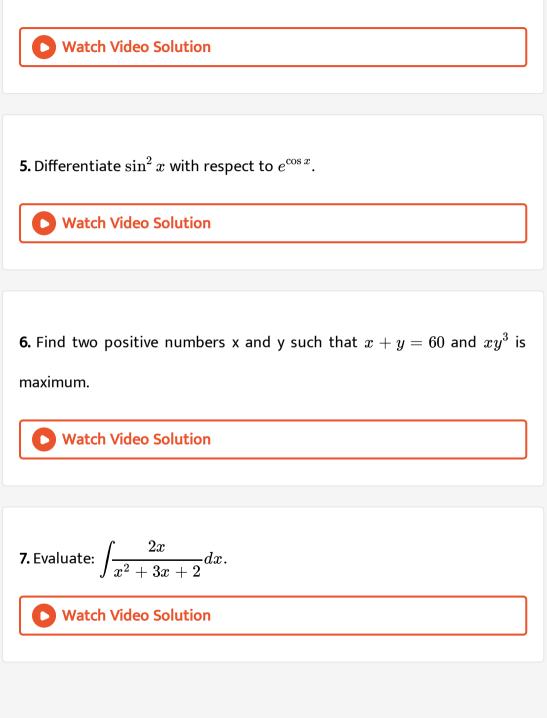
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2. Write $\tan^{-1}\left(\dfrac{\sqrt{1 + x^2} - 1}{x}\right)$, $x \neq 0$ in the simplest form.

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3. If A and B are symmetric matrices of the same order.then show that AB is symmetric if and only if AB=BA.

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4. Differentiate $(\log_e x)\cos x$ with respect to x.

5. Differentiate $\sin^2 x$ with respect to $e^{\cos x}$.

6. Find two positive numbers x and y such that $x + y = 60$ and xy^3 is maximum.

7. Evaluate: $\int \dfrac{2x}{x^2 + 3x + 2} dx$.

8. Find : $\int e^x \sin x \, dx.$

9. Find the area of the region bounded by the curve $y^2 = 4x$ and the line x=3.

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

11. Find x such that the four point A(3,2,1),B(4,x,5),C(4,2,-2) and D(6,5,-1) are coplanar.

12. Three vectors $\bar{a}$, $\bar{b}$ and $\bar{c}$ satisfy the condition $\vec{a} + \vec{b} + \vec{c} = \vec{0}$

evaluate

$\mu = \vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ if $\left|\vec{a}\right| = 1, \left|\vec{b}\right| = 4$ and $\left|\vec{c}\right| = 2$

13. Find the shortest distance between the lines.

$r = \left(\hat{i} + 2\hat{j} + \hat{k}\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and $r = \left(2\hat{i} - \hat{j} - \hat{k}\right) + \mu\left(2\hat{i} + \hat{j} +\right.$

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14. Given that the two numbers appearing on throwing two dice are different . Find the probability of the events 'the sum of numbers on the dice is 4' .

15. Let $f: N \to R$ be defined by $f(x) = 4x^2 + 12x + 15$, show that $f: N \to S$, where S is the range of f, is invertible. Also find the inverse.

Part D

1. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$.

2. Solve the following system of linear equation by matrix method.

$x - y + 2z = 1$

$2y - 3z = 1$

and $3x - 2y + 4z = 2$.

3. If $y = \left(\tan^{-1} x\right)^2$ then show that

$$\left(x^2 + 1\right)^2 \frac{d^2y}{dx^2} + 2x\left(x^2 + 1\right) \frac{dy}{dx} = 2$$

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4. The length x of rectangle is decreasing at the rate of 5cm/minute and width y is increasing at the rate of 4 cm/minute. When x=8 cm and y=6 cm, find the rate of change of (i) the perimeter and (ii) the Area of the rectangle.

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5. Find the integral of $\sqrt{x^2 - a^2}$ with respect to x and hence evaluate $\int \sqrt{x^2 - 8x + 7}dx$.

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6. Using integration find the area of the triangular region whose sides have the equations $Y = 2x + 1, y = 3x + 1$ and $x = 4$.

7. solve the differential equation $\cos^2 x \dfrac{dy}{dx} + y = \tan x \left(0 \le x < \dfrac{\pi}{2} \right)$.

8. Derive the equation of a plane perpendicular to a given vector and passing through a given point in both vector form and Cartesian form.

9. The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs.

(i) none

(ii) not more than one

(iii) more than fuse after 150 days of use.