MATHS

BOOKS - SUNSTAR MATHS (KANNADA ENGLISH)

P.U .BOARD LATEST MODEL QUESTION PAPER - 2

Part A

1. Define a binary operation on a set

A.

B.

C.

D.

Answer: $a*b,\ \forall a, b \in A$

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2. Write the range of $f(x) = \sin^{-1} x \text{ in } [0, 2\pi]$ other than $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

A.

B.

C.

D.

Answer: $\left[-\frac{3\pi}{2}, \frac{-\pi}{2}\right]$ or $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$

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3. If a matrix has 7 elements, write all possible orders it can have.

A.

B.

C.

D.

Answer: Possible orders are $1 \times 7 \text{ and } 7 \times 1$

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4. If A is square matrix of order 3 and $|A| = 4$,then find $|adjA|$

A.

B.

C.

D.

Answer: 16

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5. If $y = e^{\log x}$, show that $\frac{dy}{dx} = 1$

A.

B.

C.

D.

Answer:

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6. Evaluate $\int\left(\frac{d}{dx}e^{5x}\right)dx$

A.

B.

C.

D.

Answer: $\int\frac{d}{dx}\left(e^{5x}\right)dx = e^{5x}$

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7. If $\vec{a}$ is a unit vector such that $\left(\vec{x}-\vec{a}\right).\left(\vec{x}+\vec{a}\right)=8$, find |x|.

A.

B.

C.

D.

Answer: $\therefore \left|\vec{x}\right|^2=9$ or $\left|\vec{x}\right|=3$

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8. Find the equation of plane with intercept 2,3 and 4 on x,y and z axis respectively.

A.

B.

C.

D.

Answer: $6x + 4y + 3z = 12$

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9. Define optimal solution in linear programming problem .

A.

B.

C.

D.

Answer: Optional solution : Any point in the feasible region that gives the optional value of the objective function is called the optional solution.

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10. A fair die is rolled. Consider the events $E = \{1, 3, 5\}$ and $F = \{2, 3\}$, find $P(E \mid F)$.

A.

B.

C.

D.

Answer: $\frac{1}{2}$

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Part B

1. Define an equivalence relation and give an example.

A.

B.

C.

D.

Answer:

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2. prove that $3\sin^{-1}x = \sin^{-1}\left(3x - 4x^3\right), x \in \left[\frac{-1}{2}, \frac{1}{2}\right]$

A.

B.

C.

D.

Answer:

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3. Write in the simplest form of $\tan^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}, 0 < x < \pi$

A.

B.

C.

D.

Answer: $\frac{x}{2}$

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4. Find 'c' of the mean value theorem for the function $f(x) = 2x^2 - 10x + 29$ in [2,9].

A.

B.

C.

D.

Answer: $\frac{9}{2} \in (2, 7)$

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5. Find a point on the curve $y = (x - 2)^2$ at which the tangent is parallel to the x-axis .

A.

B.

C.

D.

Answer: Point is (2,0)

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6. Evaluate $\int \frac{\sin^2 x}{1+\cos x} dx$

A.

B.

C.

D.

Answer: $= x - \sin x + c$

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7. Find $\int_2^3 \frac{x}{x^2+1} dx$

A.

B.

C.

D.

Answer: $\frac{1}{2}\log 2$

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8. Form the differential equation of the family of curve $y^2 = a\left(b^2 - x^2\right)$.

A.

B.

C.

D.

Answer: $xyy_2 + xy_1^2 - yy_1 = 0$ **is the differential equation**

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9. Find the unit vector in the direction of $\vec{a} = \hat{i} - 2\hat{j}$, also find the vector whose magnitude is 7 units and in the direction $\vec{a}$.

A.

B.

C.

D.

Answer: $\frac{7\left(\hat{i}-2\hat{j}\right)}{\sqrt{5}}$

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10. If $\vec{a}.\vec{b}=\sqrt{15}, \left|\vec{b}\right|=\sqrt{3}$ and angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{3}$, find $\left|\vec{a}\right|$

A.

B.

C.

D.

Answer: $\left|\overrightarrow{a}\right| = 2\sqrt{5}$

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11. Find the angle between the pair of planes $7x + 5y + 6z + 30 = 0$ and $3x - y - 10z + 4 = 0$

A.

B.

C.

D.

Answer: $\cos^{-1}(2/5)$

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12. Find the probability distribution of number of heads in two tosses of a coin .

A.

B.

C.

D.

Answer:

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Part C

1. If f : $B \to N, g: N \to N$ and $h: N \to R$ defined as f(x) = 2x , g(y) = $3y + 4$ and h(x) = sin x , $\forall$ x, y, z in N . Show that h $ho(gof) = (hog)of$

A.

B.

C.

D.

Answer:

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2. Show that $\sin^{-1}\frac{12}{13} + \cos^{-1}\frac{4}{5} + \tan^{-1}\frac{63}{16} = \pi$

A.

B.

C.

D.

Answer:

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3. If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, show that $A^2 = \begin{bmatrix} \cos 2x & \sin 2x \\ -\sin 2x & \cos 2x \end{bmatrix}$ and $A^1 A = 1.$

A.

B.

C.

D.

Answer:

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4. Find $\frac{dy}{dx}$ if $x^3 + x^2y + xy^2 + y^3 = 81$

A.

B.

C.

D.

Answer: $\frac{dy}{dx} = \frac{-\left(3x^2 + 2xy + y^2\right)}{\left(x^2 + 2xy + 3y^2\right)}$

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5. Differentiate $(x\cos x)^x + (x\sin x)^{1/x}$ with respect to x.

A.

B.

C.

D.

Answer:

$$\frac{dy}{dx} = (x\cos x)^x[-x\tan x + 1 + \log(x\cos x)] + (x\sin x)^{1/x}\left[\frac{1}{x}\cot x +$$

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6. Find the absolute maximum value and the absolute minimum value of the functions $f(x) = \sin x + \cos x, x \in [0, \pi]$.

A.

B.

C.

D.

Answer: -1

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7. Find $\int \frac{xe^x}{(1+x)^2} dx$

A.

B.

C.

D.

Answer: $= e^x . \frac{1}{x+1} + C$

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8. Evaluate: $\int \frac{2}{(1-x)(1+x^2)} dx$

A.

B.

C.

D.

Answer: $= -\log|1-x| + \frac{1}{2}\log|1+x^2| + \tan^{-1} x + C$

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9. Find the area bounded by the the curve y=cos x between x=0 and $x = 2\pi$.

A.

B.

C.

D.

Answer: 4

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10. Find the general solution of $\frac{dy}{dx} + y = 1 (y \neq 1)$

A.

B.

C.

D.

Answer: $y = 1 - e^{-(x+c)}$ **is the solution**

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11. Find the value of p so that the lines $\frac{1-x}{3}=\frac{7y-14}{2p}=\frac{z-3}{2}$ and $\frac{7-7x}{3p}=\frac{y-5}{1}=\frac{6-z}{5}$ are at right angles .

A.

B.

C.

D.

Answer: $p=\frac{70}{11}$

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12. Find the area of the rectangle having vertices A,B,C and D with position vectors.

$-\hat{i}+\frac{1}{2}\hat{j}+4\hat{k}, \hat{i}+\frac{1}{2}\hat{j}+4\hat{k}, \hat{i}-\frac{1}{2}\hat{j}+4\hat{k}$ and $-\hat{i}-\frac{1}{2}\hat{j}+4\hat{k}$

respectively.

A.

B.

C.

D.

Answer: Area of rectangle=2 sq. units

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13. Show that four points A,B,C and D with position vectors $4i + 5j + k, \ -(j + k), 3i + 9j + 4k$ and $-4i + 4j + 4k$ respectively coplanar.

A.

B.

C.

D.

Answer:

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14. In answering a question on a multiple choice test a student either knows the answer or guesses. Let 3/4 be the probability that he knows the answer and 1/4 be the probability that he guesses. Assuming that a student who guesses the answer will be correct with probability 1/4. What is the probability that a student knows the answer given that he answered it correctly.

A.

B.

C.

D.

Answer: $\frac{12}{13}$

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15. If $f: A \to A$ defined by $f(x) = \frac{4x+3}{6x-4}$ where $A = R - \left\{\frac{2}{3}\right\}$, show that f is invertible and $f^{-1} = f$.

A.

B.

C.

D.

Answer:

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16. If $A = \begin{pmatrix} 1 & 1 & -1 \\ 2 & 0 & 3 \\ 3 & -1 & 2 \end{pmatrix}, B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 3 & -4 \\ 2 & 0 & -2 & 1 \end{bmatrix}$ prove that (AB)C=A(BC)

A.

B.

C.

D.

Answer:

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17. Solve by matrix method:

$4x + 3y + 2z = 60, x + 2y + 3z = 45, 6x + 2y + 3z = 70$

A.

B.

C.

D.

Answer: x=5 ; y=8. z=8

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18. If $y = 3\cos(\log x) + 4\sin(\log x)$ show that $x^2y_2 + xy_1 + y = 0$

A.

B.

C.

D.

Answer: $\Rightarrow x^2y_2 + xy_1 + y = 0$

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19. A ladder 5cm long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall at the rate of 2cm/sec. How fast is its height on the wall decreasing when the foot of the ladder is 4m away from the wall?

A.

B.

C.

D.

Answer: Top end of ladder is decreasing at the rate of $\frac{8}{3}$ cm/s.

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20. Find the integral of $\sqrt{x^2 - a^2}$ with respect to x.

A.

B.

C.

D.

Answer: $\frac{x+2}{2}\sqrt{(x+2)^2 - 9} - \frac{9}{2}\log\left|x + 2 + \sqrt{(x+2)^2 - 9}\right| + C$

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21. Find the area of the smaller region enclosed by the circle $x^2 + y^2 = 4$ and the line x+y=2 by the integration method.

A.

B.

C.

D.

Answer: Required Area=$\pi - 2$ square points .

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22. Solve the differential equation $\frac{dy}{dx} + 2y\tan x = \sin x, y = 0$ when $x = \frac{\pi}{3}$

A.

B.

C.

D.

Answer: $\therefore y\sec^2 x = \sec x - 2$

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

A.

B.

C.

D.

Answer: $A(x - x_1) + B(y - y_1) + C(z - z_1) = 0$

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24. In an examination 20question of true-false are asked. Suppose a student tosses a fair coin to determine his answer to each question. If the coin falls heads, the answer 'true', if it falls tails, he answers. 'false' find the probabilities that he answers at least 12 questions correctly

A.

B.

C.

D.

Answer: $\frac{1}{2^{20}}\left[.^{20}C_{12} + .^{20}C_{13} + \ldots\ldots + .^{20}C_{20}\right]$

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Part E

1. One kind of cake requires 200 gm of flour and 25 g of fat and another kind of cake requires 100 gm of flour and 50 gm of fat. Find the maximum number of cakes which can be made from 5kg of flour and 1kg of fat assuming that there is no shortage of the other ingredients used in making the cakes.

A.

B.

C.

D.

Answer:

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2. Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$

A.

B.

C.

D.

Answer: $= (a-b)(b-c)(c-a)(a+b+c)$

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3. Evaluate $\int_{-\pi/2}^{\pi/2} \left(x^3 + x\cos x + \tan^5 x + 1\right) dx$

A.

B.

C.

D.

Answer: $= \pi$

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4. Find all points of discontinuity of f, where f is defined by

$$f(x) = \begin{cases} 2x + 3, & \text{if} x \leq 2 \\ 2x - 3, & \text{if} \quad x > 2 \end{cases}$$

A.

B.

C.

D.

Answer: $\therefore$ **x=2 is the only point of discontimity**

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