Kerala Plus Two Class 12 Mathematics Answer Key 2024

Question 1(i) R={(1,1),(2,3),(3,5),(4,7),(5,9),(6,11)}

Question 1(ii)

To determine whether R is an equivalence relation, we need to verify three properties:

1. Reflexivity: (a, a) is in R for all a in the set.
2. Symmetry: If (a, b) is in R, then (b, a) must also be in R.
3. Transitivity: If (a, b) and (b, c) are in R, then (a, c) must also be in R.

Let's analyze each property:

1. Reflexivity: For R, (a, a) should be in R for every a in the set. In our case, for every a in the set $A = \{1, 2, 3, 4, 5, 6\}$, the pairs $(a, 2a - 1)$ are in R. Since (a, a) can be rewritten as $(a, 2a - 1)$ for every a, R is reflexive.
2. Symmetry: If (a, b) is in R, then (b, a) must also be in R. In our relation, $R = \{(1, 1), (2, 3), (3, 5), (4, 7), (5, 9), (6, 11)\}$. We notice that the relation is not symmetric. For instance, $(2, 3)$ is in R, but $(3, 2)$ is not. Therefore, R is not symmetric.
3. Transitivity: For R to be transitive, if (a, b) and (b, c) are in R, then (a, c) must also be in R. However, R doesn't fulfill this condition. For instance, $(2, 3)$ and $(3, 5)$ are in R, but $(2, 5)$ is not in R. Thus, R is not transitive.

Since R fails to satisfy both the symmetry and transitivity properties, it is not an equivalence relation.

Question 2

$$A^2 = A \cdot A = (3)1 - 12 \cdot (3)1 - 12$$

Performing the matrix multiplication:

$$A^2 = (()3 \times 3 + 1 \times (-1))(3 \times 1 + 1 \times 2)((-1) \times 3 + 2 \times (-1))((-1) \times 1 + 2 \times 2)$$

$$A^2 = (()9 - 1)(3 + 2)((-3) + (-2))((-1) + 4)$$

$$A^2 = (8)5 - 53$$

2. $5A$:

$$5A = 5 \times (3)1 - 12 = (1)55 - 510$$

3. $7I$:

$$7I = 7 \times (1)001 = (7)007$$

Now, let's subtract $5A$ from A^2 and add $7I$:

$$A^2 - 5A + 7I = (8)5 - 53 - (1)55 - 510 + (7)007$$

$$= (()8 - 15 + 7)(5 - 5)((-5) - (-5) + 0)(3 - 10 + 7)$$

$$= (0)000$$

So, $A^2 - 5A + 7I = (0)0$
00

-

Question 3(i)

To check the continuity of the function $f(x) = 2x + 3$ at $x = 1$, we need to examine three conditions:

The function $f(x)$ is defined at $x = 1$.
The limit of $f(x)$ as x approaches 1 exists.
The value of $f(x)$ at $x = 1$ is equal to the limit.

Let's evaluate each condition:

$f(1) = 2(1) + 3 = 2 + 3 = 5$. The function is defined at $x = 1$.
$\lim_{x \to 1}(2x + 3) = 2(1) + 3 = 2 + 3 = 5$. The limit as x approaches 1 exists and equals 5.
$f(1) = 5$. The value of the function at $x = 1$ is indeed 5.

Since all three conditions are satisfied, the function $f(x) = 2x + 3$ is continuous at $x = 1$.

Question 3(ii) - k=9/5

Question 4(i) - 30 degrees or π/6 radians

Question 4(ii) - 45 degrees or π/4 radians

Question 5(i) - log(x)

Question 5(ii) - a) Increases for x>2

b) decreases in x<2

Question 6(i) - π/4 radians

Question 6(ii) - zero vector

Question 7(i) - 0.12

Question 7(ii) - 0.58

Question 7(iii) - 0.3

Question 8 -

To integrate the function $5x^4\sqrt{x^5+1}$ from -1 to 1, we can use the substitution method. Let's set:

$u = x^5 + 1$

Then, we have:

$\frac{du}{dx} = 5x^4$
$dx = \frac{du}{5x^4}$

Now, we need to determine the limits of integration when $x = -1$ and $x = 1$:

When $x = -1$:
$u = (-1)^5 + 1 = -1 + 1 = 0$

When $x = 1$:
$u = 1^5 + 1 = 1 + 1 = 2$

When $x = 1$:
$u = 1^5 + 1 = 1 + 1 = 2$

So, the new integral becomes:

$\int_0^2 \sqrt{u}\, du$

Now, integrate $\sqrt{u}$ with respect to u:

$\int_0^2 u^{\frac{1}{2}}\, du = \left[\frac{2}{3}u^{\frac{3}{2}}\right]_0^2$

$= \frac{2}{3}(2^{\frac{3}{2}} - 0^{\frac{3}{2}})$
$= \frac{2}{3}(2\sqrt{2})$
$= \frac{4\sqrt{2}}{3}$

So, the value of the integral $\int_{-1}^{1} 5x^4\sqrt{x^5+1}\, dx$ is $\frac{4\sqrt{2}}{3}$.

Question 9

In a reflexive relation on a set of *'n'* elements, each element must be related to itself. Therefore, each element contributes one ordered pair to the reflexive relation.

For a set of four elements, there are four elements in total. Each element must be related to itself in a reflexive relation.

So, the minimum number of ordered pairs needed to form a reflexive relation on a set of four elements is 4.

Question 18 (i)

To find $\frac{dy}{dx}$ from the equation $6x + \cos(y) = xy$, we'll need to use implicit differentiation.

Given the equation:

$$6x + \cos(y) = xy$$

We differentiate both sides of the equation with respect to x:

$$\frac{d}{dx}(6x) + \frac{d}{dx}(\cos(y)) = \frac{d}{dx}(xy)$$

Now, applying the chain rule for $\frac{d}{dx}(\cos(y))$:

$$6 + (-\sin(y))\frac{dy}{dx} = x\frac{dy}{dx} + y$$

Now, we need to solve for $\frac{dy}{dx}$. Let's isolate $\frac{dy}{dx}$:

$$(-\sin(y))\frac{dy}{dx} - x\frac{dy}{dx} = y - 6$$

$$(-\sin(y))\frac{dy}{dx} - x\frac{dy}{dx} = y - 6$$

$$\frac{dy}{dx}(-\sin(y) - x) = y - 6$$

$$\frac{dy}{dx} = \frac{y-6}{-\sin(y)-x}$$

This is the derivative $\frac{dy}{dx}$ in terms of x and y from the given equation $6x + \cos(y) = xy$.

Question 18(ii)

To find $\frac{dy}{dx}$ in terms of t given $x = a(\cos t)^3$ and $y = b(\sin t)^3$, we'll use implicit differentiation.

We have:

$x = a(\cos t)^3$
$y = b(\sin t)^3$

We'll differentiate both equations with respect to t using the chain rule:

For x:

$\frac{dx}{dt} = 3a(\cos t)^2 \cdot (-\sin t) = -3a(\cos t)^2 \sin t$

For y:

$\frac{dy}{dt} = 3b(\sin t)^2 \cdot \cos t = 3b(\sin t)^2 \cos t$

Now, we can find $\frac{dy}{dx}$ using the chain rule for differentiation:

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$

Substitute the derivatives we found:

$\frac{dy}{dx} = \frac{3b(\sin t)^2 \cos t}{-3a(\cos t)^2 \sin t}$

Simplify:

$\frac{dy}{dx} = -\frac{b(\sin t)^2 \cos t}{a(\cos t)^2 \sin t}$
$\frac{dy}{dx} = -\frac{b}{a} \cdot \frac{\sin t}{\cos t}$

Since $\frac{\sin t}{\cos t} = \tan t$, we have:

$\frac{dy}{dx} = -\frac{b}{a} \tan t$

So, $\frac{dy}{dx}$ in terms of t is $-\frac{b}{a} \tan t$.