MTH-100

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VU nexus

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Question No 01 :

$$\left|\frac{3-5i}{5+7i}\right|$$

Solution :

$$= \frac{3-5i}{5+7i} \times \frac{5-7i}{5-7i}$$

$$= \frac{(3-5i)(5-7i)}{(5-7i)(5+7i)}$$

$$= \frac{15-21i-25i+35i^2}{(5)^2-(7i)^2}$$

$$= \frac{15-46i+35(-1)}{25-49i^2}$$

$$= \frac{-20-46i}{25-49(-1)}$$

= -1

$$= \frac{-20-46i}{25+49}$$

$$= \frac{-20-46i}{74}$$

$$= \frac{-20}{74} - \frac{46}{74}i$$

$$\left|\frac{3-5i}{5+7i}\right| = \sqrt{\left(\frac{(-20)}{74}\right)^2 + \left(\frac{46}{74}\right)^2}$$

$$= \sqrt{\frac{400}{5476} + \frac{2116}{5476}}$$

$$= \sqrt{\frac{2516}{5476}}$$

Question No 02

Determine whether the function f(x) = 2/x is even or odd. Also, find its domain and range.

Answer:

To determine whether the function f(x) = $\frac{2}{x}$ is even or odd, we can use the definitions:

- A function is even if $f(-x) = f(x)$ for all x
- A function is odd if f(-x)= -$f(x)$) for all x

Step 1: Check if the function is even or odd

1. Calculate f($-x$)

f($-x$)= $\frac{2}{-x}$ = $-\frac{2}{x}$

2. Compare f($-x$) with -f(x)

-f(x) = - ($\frac{2}{x}$) = -$\frac{2}{x}$

Since f($-x$) = $-f(x)$ the function is odd.

Step 2: Determine the domain

The function f$(x) = \frac{2}{x}$ is defined for all real numbers except where the denominator is zero. Thus, the domain is:

Domain: (-∞, 0) U (0, ∞)

Step 3: Determine the range

The function f(x) = 2/x can take on all real values except for zero. As x approaches 0 from the left, F(x) approaches ∞, and as x approaches 0 from the right, f(x) approaches +∞

Therefore, the range is:

Range : : (-∞, 0) U (0, ∞)

Summary

- **The function f(x) = 2/x is odd.**
- **Domain: (-∞, 0) U (0, ∞)**
- **Range: (-∞, 0) U (0, ∞)**

Question No 03

Let f(x) = 5x + 3 and g(x) = 3x - 5 be the two functions then find the composite

Functions (f o g) (x) and (g o f) (x).

Answer:

First = (f o g) (x)

F (g(x)) = f (3x-5)

F (3x-5) = 5(3x-5) +3

= 15x -25 +3

= 15x – 22

——► Now: (g o f) (x)

g (f(x)) = g (5x+ 3)

= (3 (5x+ 3) -5)

= 15x + 9 -15

= 15x+4

Question 04

Solve the following system of equations by applying row operation.

3x, + 3x2 = 15

15x1 + 16x2 = 23

Answer:

To solve the system of equations using row operations, let's first write down the system in matrix form:

The system is:

$3x_1 + 3x_2 = 15$

$15x_1 + 16x_2 = 23$

In matrix form, this is:

$[3\ 3\ 15\ 16\ ]\begin{bmatrix} x_1 & x_2 \end{bmatrix} = [15\ 23\ ]$

Now, we'll apply row operations to solve for X_1 and X_2

Step 1: Form the augmented matrix:

$$(15\ 23\ )$$

Step 2: Make the leading coefficient of the first row equal to 1

To make the leading coefficient in the first row a 1, divide the entire first row by 3:

$$(5\ 23\ )$$

Step 3: Eliminate the x_1 term in the second row

To make the x_1 coefficient in the second row 0, subtract 15 times the first row from the second row:

$R_2 = R_2 - 15R_1$

$$(5\ -\ 52\ )$$

Step 4: Substitute back to find X_1 and X_2

Now we have:

$X1 + X_2 = 5$

$X_2 = -52$

From the second equation, we get $x_2 = -52$ substitutes $x_2 = -52$ into the first equation:

$X_1 + (-52) = 5$

$X_1 = 5 + 52 = 57$

Solution

The solution to the system is:

$X_1 = 75$, $X_2 = -52$