كلية : التربية للعلوم الصرفة

القسم او الفرع : الرياضيات

المرحلة: الاولى

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اسم المادة باللغة العربية : التفاضل والتكامل

اسم المادة باللغة الإنكليزية : Calculus

اسم المحاضرة الثانية باللغة العربية: (الدوال)

اسم المحاضرة الثانية باللغة الإنكليزية : (The Function)

H.W.

1- $2x - 3 < 7$

2- $2x + 4 < x - 4$

3- $\frac{4}{x} < \frac{3}{5}$

4- $\left|\frac{x+3}{6-5x}\right| \leq 2$

5- $\frac{x-2}{x+3} < \frac{x+1}{x}$

6- $|x(x+1)| \leq |x+4|$

4- The Functions

Definition:- A relation between two set A and B , $f: A \to B$ is called a function if and only if for each element $x \in A$ their exist unique element $y \in B$ such that $y = f(x)$.

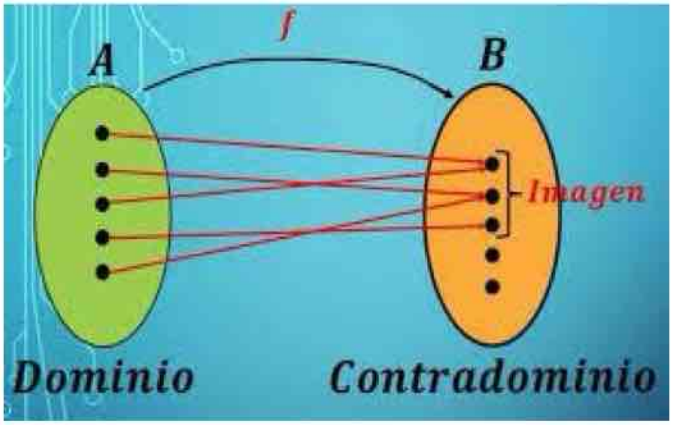
Notes

1- $(x, y) \in f \implies y = f(x)$.

2- The set A is called the domain D_f .

3- The set B is called the co-domain.

4- The set of all element of B such that $y = f(x)$ is called the range and represented R_f



Example:- Find the Domain and the Range for each functions

1- $y = x^2$ $\Longrightarrow$ **Domain = R , Range = R**

2- $y = x + 3$ $\Longrightarrow$ **Domain = R , Range = R**

3- $y = \sqrt{x-4}$

$$\Longrightarrow x - 4 \geq 0 \Longrightarrow x - 4 + 4 \geq 0 + 4 \Longrightarrow x \geq 4$$

Then $D_f = \{x: x \geq 4\}, \quad R_f = \{y: y \geq 0\}$

4- $y = \frac{x-3}{x+2}$

$$\Longrightarrow x + 2 = 0 \Longrightarrow x = -2 \Longrightarrow D_f = R/\{-2\}$$

$$\Longrightarrow y(x+2) = x - 3 \Longrightarrow yx + 2y = x - 3$$

$$\Longrightarrow yx - x = -3 - 2y \Longrightarrow x(y-1) = -3 - 2y$$

$$\Longrightarrow x = \frac{-3-2y}{y-1}$$

$$\Longrightarrow y - 1 = 0 \Longrightarrow y = 1 \Longrightarrow R_f = R/\{1\}$$

H.W.

Find the Domain and the Range for the functions

1- $y = \frac{1}{x-2}$

2- $f(x) = \frac{1}{\sqrt{x+3}}$

3- $y = x^2 - 5x + 6$

4- $y = \sqrt{x^2 - 9}$

5- $y = \sqrt{x^2 - 2x - 3}$

6- $f(x) = \frac{\sqrt{x-1}}{x^2+4}$

Some types of Function

Definition 1:- Absolute Value Function is define by

$$f(x) = |x| = \begin{cases} x & if \quad x \geq 0 \\ -x & if \quad x < 0 \end{cases}.$$

Definition 2:- A function is called even function if $f(-x) = f(x)$.

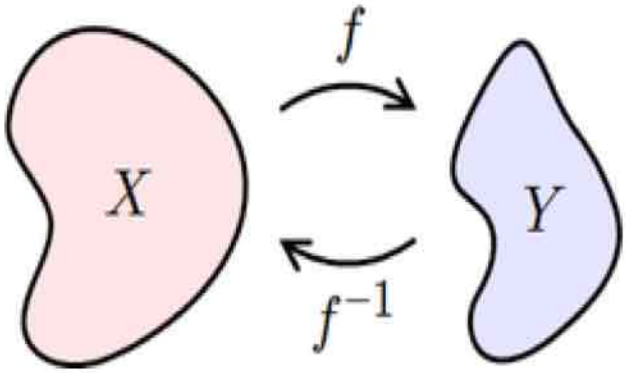
Definition 3:- A function is called odd function if $f(-x) = -f(x) \neq f(x)$.

Definition 4:- A function is called constant function if $f(x) = a_0$, $\forall a \in \mathbb{R}$.

Definition 5:- A function is called linear function if $f(x) = a_1 x + a_0$, $\forall a \in \mathbb{R}$.

Definition 6:- A function subjective $f(x): X \to Y$, we define the invers function such that $x = f^{-1}(y): Y \to X$.

$$f\left(f^{-1}(y)\right) = x \qquad D_{f^{-1}} = R_f, D_f = R_{f^{-1}}$$



Example:- $y = f(x) = x^3$ **Find invers function and** $D_{f^{-1}}, R_{f^{-1}}$

Solve:

$$y = x^3 \Longrightarrow x = \sqrt[3]{y} = f^{-1}(y)$$

$$D_{f^{-1}} = \mathbb{R}^+, \qquad R_{f^{-1}} = \mathbb{R}.$$

Composite of Function

Definition:- If we have the two functions $f(x), g(x)$ **then we define a composite function as**

$$z = f\big(g(x)\big) = f \circ g(x) \quad or \quad z = g\big(f(x)\big) = g \circ f(x)$$

$$X \xrightarrow{\ f\ } Y \xrightarrow{\ g\ } Z$$

Example:- $f(x) = \sqrt{x},\ \ g(x) = x^2$ **Find** $f \circ g(x) \quad and \quad g \circ f(x)$.