جامـــــعـة المـــــستـقـبـل
AL MUSTAQBAL UNIVERSITY

كلية العلـــــوم
قــســــــــــم علوم الذكاء الاصطناعي

المحاضرة الخامسة

المادة : mathematics
المرحلة : الاولى
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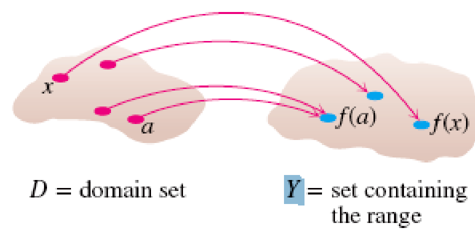
Functions الدوال

DEFINITION: Function

A **function** is a set D (domain) to a set R (range) is a rule that assigns to unique (single) element $f(x)\in R$ to each element $x\in D$.



$\boldsymbol{F}:\boldsymbol{X}\rightarrow\boldsymbol{F}(\boldsymbol{X})$ it means that f sends x to f(x)=y

- **The set of x is called the "Domain" of the function (D_f).**
- **The set of y is called the "Range" of the function (Rf).**

Domain (Df): is the set of all possible inputs (x-values).
Range (Rf): is the set of all possible outputs (y-values).

Note: To find Domain (Df) and the Range (Rf) the following points must be noticed:

1- The denominator in a function must not equal zero (never divide by zero).
2- The values under even roots must be positive.

Examples: Find the Domain (Df) and Range (Rf) of the following functions:

1- $y=f(x)=\frac{1}{x}$

Sol: denominator must not equal zero

$$x\neq 0$$

✓ Df =R/{0}

To find Rf : we must convert the function from y=f(x) into x=f(y).

$y = \frac{1}{x} \quad \rightarrow \qquad x = \frac{1}{y}$

✓ Rf =R/{0}.

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2- $y = \sqrt{3 - X}$

$$3 - X \geq 0 \rightarrow \quad 3 \geq X$$

✓ $Df = \{x \in R \ / \ x \leq 3\}$

To find Rf : we must convert the function from y=f(x) into x=f(y).

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

✓ $Rf = \{y \in R\}$.

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H.W: Find the Domain (Df) and Range (Rf) of the following functions:

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

2- $y = 2x^2$

3- $y = \sqrt{5 - 2X}$

Sums, Difference, Product and Quotients of Functions:

جمع، طرح، ضرب وقسمة الدوال

Definition: If F and G are functions, then we define the functions

- ✓ Sum → (F+G)(x)= F(x)+G(x)
- ✓ Difference → (F - G)(x)= F(x) - G(x)
- ✓ Product → (F * G)(x)= F(x) *G(x)
- ✓ Quotient → (F / G)(x)= F(x) /G(x) , where $g(x) \neq 0$

Example 1: Combining Functions Algebraically

The function defined by the formulas

f (x) =$\sqrt{x}$ and g(x) = $\sqrt{1-x}$

Function	Formula
$f+g$	$(f+g)(x)=\sqrt{x}+\sqrt{1-x}$
$f-g$	$(f-g)(x)=\sqrt{x}-\sqrt{1-x}$
$g-f$	$(g-f)(x)=\sqrt{1-x}-\sqrt{x}$
$f \circ g$	$(f \circ g)(x)=f(x)g(x)=\sqrt{x(1-x)}=\sqrt{x-x^2}$
f/g	$\frac{f}{g}(x)=\frac{f(x)}{g(x)}=\sqrt{\frac{x}{1-x}}$
g/f	$\frac{g}{f}(x)=\frac{g(x)}{f(x)}=\sqrt{\frac{1-x}{x}}$

H.W: Combining Functions Algebraically The function defined by the formulas **f (x) = 3x and g(x) = $1-x^2$** .