



Example 8: Find the line L1 passes through the point P(1,2) and parallel the line L2: $x + 2y = 3$.

SOL:

L1: P(1,2) M=???

L2: $x + 2y = 3$.

L1 parallel the line L2 so that $m_1 = m_2$.

$$x + 2y = 3$$

$$y = -1/2 X + 3/2$$

then $m_2 = -1/2$ so that $m_1 = -1/2$

$$y = y_1 + m(x - x_1)$$

$$y = 2 + \left(-\frac{1}{2}\right)(x - 1)$$

$$y = 2 + \left(-\frac{1}{2}x + \frac{1}{2}\right)$$

$$y = -\frac{1}{2}x + \frac{5}{2}$$

H.W:

Find the line L1 passes through the point (-2,2) and perpendicular to the line L2 : $2x + y = 4$.



The Distance from a Point to a Line:

The distance (d) between the line L is $Ax + By + C = 0$ and the point $P(x_1, y_1)$:

$$d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$$

Example 9: Find the distance from the point $P(2,1)$ to the line $y = x + 2$

SOL:

1- put the line in the general form $Ax + By + C = 0$

$$y = x + 2$$

$$-x + y - 2 = 0$$

so that $A = -1$, $B = 1$, $C = -2$, $x_1 = 2$, $y_1 = 1$

$$d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}} = \frac{|-1 * (2) + 1 * (1) + (-2)|}{\sqrt{(-1)^2 + (1)^2}}$$
$$= \frac{|-3|}{\sqrt{2}} = \frac{3}{\sqrt{2}}$$

H.W:

1-Find the distance from the point $P(3,2)$ to the line $y = 3x - 4$.

2-Find the distance from the point $P(-4,1)$ to the line $y = -2x + 1$.

3- Find the following:

- The slope of the line $2x + 3y - 5 = 0$?

- The distance from the above line to the point $P(-1,0)$.

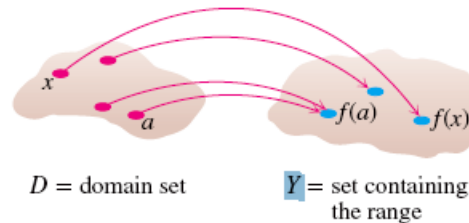


الدوال Functions

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 $x \in D$.

$F: X \rightarrow F(X)$ 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 (R_f).

Domain (D_f): is the set of all possible inputs (x -values).

Range (R_f): is the set of all possible outputs (y -values).

Note: To find Domain (D_f) and the Range (R_f) 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 = $\mathbb{R} / \{0\}$

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

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

✓ Rf = $\mathbb{R} / \{0\}$.

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

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

✓ Df = $\{x \in \mathbb{R} / x \leq 3\}$

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 = $\{y \in \mathbb{R}\}$.

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:

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

- ✓ Sum $\rightarrow (F+G)(x)= F(x)+G(x)$
- ✓ Difference $\rightarrow (F - G)(x)= F(x) - G(x)$
- ✓ Product $\rightarrow (F * G)(x)= F(x) *G(x)$
- ✓ Quotient $\rightarrow (F / G)(x)= F(x) /G(x)$, 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
$f + g$	$(f + g)(x) = \sqrt{x} + \sqrt{1-x}$
$f - g$	$(f - g)(x) = \sqrt{x} - \sqrt{1-x}$
$g - f$	$(g - f)(x) = \sqrt{1-x} - \sqrt{x}$
$f \circ g$	$(f \circ g)(x) = f(g(x)) = \sqrt{g(x)} = \sqrt{\sqrt{1-x}}$
f/g	$\frac{f}{g}(x) = \frac{f(x)}{g(x)} = \frac{\sqrt{x}}{\sqrt{1-x}}$
g/f	$\frac{g}{f}(x) = \frac{g(x)}{f(x)} = \frac{\sqrt{1-x}}{\sqrt{x}}$

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