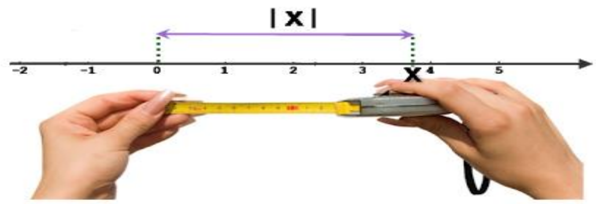
The Islamic University

Collage of Pharmacy

Mathematics

Lecturer: Athraa M. Dheyaa

(1-4)Absolute Value or Magnitude :



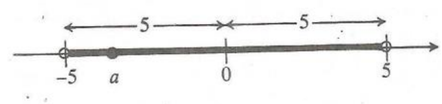
The absolute value of number is numerical

size or magnitude. |3 | = 3, |0 |=0 , |-5 |=5

The absolute value or magnitude of a number *x*, denoted by $|x|$ (read the absolute value of x"), is defined by the formula: $|x|=\begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

The connection between absolute values and distance gives as anew way to write formulas for intervals .The inequality $|a| < 5$ says that the distance from a to the origin is less than 5 .This is the same as between 5 and -5 on the number line .In symbols:

$|a| < 5 \leftrightarrow -5 < a < 5$



The set of numbers a with $|a| < 5$ is the open interval from -5 to 5 .

The general rule is this:

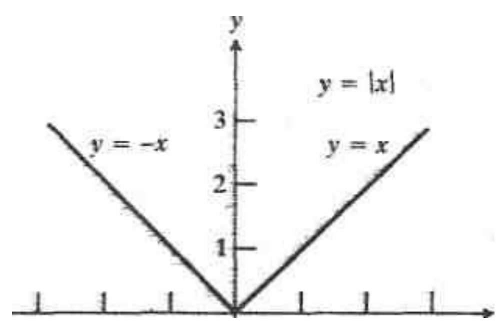
Relation between Intervals and Absolute Values

If D is any positive number, then:

$|a| < D \leftrightarrow -D < a < D$ (1)

$|a| \leq D \leftrightarrow -D \leq a \leq D$ (2)

The function $y = |x|$ is called *the absolute value function.* Its graph lies along the line $y = x$ when $x \geq 0$, and along the line $y = -x$ when $x < 0$.



EXAMPLE 1: What values of x satisfy the inequality $|x-5|$ < 9 ?

Solution:

Change $|x-5|$ < 9 to -9 < x-5 < 9 {Eq. (1) with a=x-5 and D = 9}

to -9+5 < x < 9+5 {Adding a positive number to both sides of an inequality gives an equivalent inequality. Adding 5 here isolated the z.}

or: -4 < x< 14.

The steps we just took are reversible, so the values of x that satisfy the inequality $|x-5|$ < 9 are the numbers in the interval -4 <x< 14 .

EXAMPLE 2:

Solve the equation |2x - 3| = 7

Solution : The equation says that 2x - 3 = ±7, so there are two possibilities:

a) 2x -3=7→ 2x = 10 → x=5

b) 2x -3 = -7 → 2x = -4 → x= -2

The equation |2x - 3| = 7 has two solutions: x = 5 and x = -2

EX. 3: Solve the equation $|\frac{x}{5} - 2| = 1$

Solution : The equation says that $\frac{x}{5} - 2 = \pm 1$, so there are two possibilities:

a) $\frac{x}{5} - 2 = 1 \rightarrow \frac{x}{5} = 3 \rightarrow x = 15$

b) $\frac{x}{5} - 2 = -1 \rightarrow \frac{x}{5} = 1 \rightarrow x = 5$

The equation |2x - 3| = 7 has two solutions: x =15 and x = 5

Exercise: **solutions**

1) $|x-2|$< 1/2 1) (3/2 , 5/2)

2) $|\frac{9x}{7} - 1| = 1$ 2) x=14/9 and x=0

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1^{st} class

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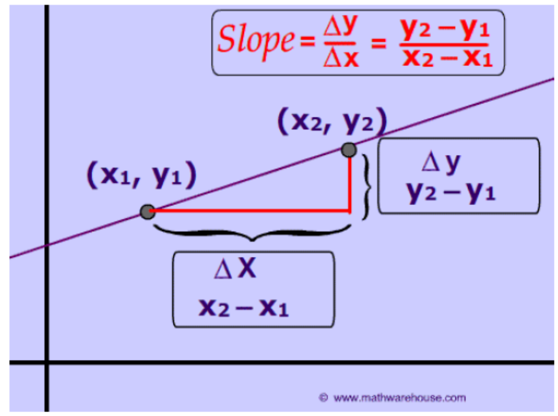
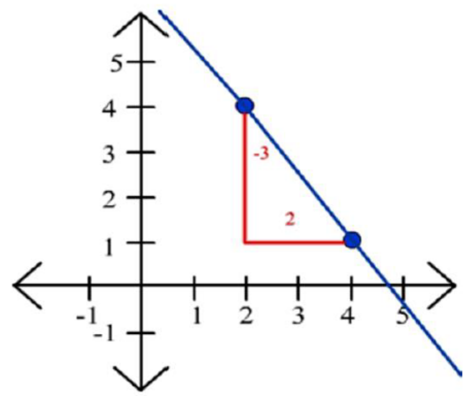
Slope (M)

M is the measure of the steepness of the line.
M in mathematics is the rate of change of **y** with respect to **x**.



How do we find Slope?

$$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{rise}{run}$$



The rise is -3 and the run is 2.
Slope = $\frac{-3}{2}$

The slope for the line above is $\frac{-3}{2}$.

It is a negative slope!

Point–Slope Equations

To write an equation for a line L that is not vertical, it is enough to know its slope m and the coordinates of a point $P_1(x_1, y_1)$ on it. If $P(x, y)$ is any other point on L (Fig. 1.24), then $x \neq x_1$ and we can write the slope of L as

$$\frac{y - y_1}{x - x_1}. \tag{8}$$

We can then set this expression equal to m to get

$$\frac{y - y_1}{x - x_1} = m. \tag{9}$$

Multiplying both sides of Eq. (9) by $x - x_1$ gives us the more useful equation

$$y - y_1 = m(x - x_1). \tag{10}$$

EXAMPLE 5 Write an equation for the line that passes through the point (2, 3) with slope $-3/2$.

Solution

$$y - y_1 = m(x - x_1) \qquad \left(\begin{array}{l}\text{Start with the general}\\ \text{point–slope equation, Eq. (11)}\end{array}\right)$$

$$y - 3 = -\frac{3}{2}(x - 2) \qquad (\text{Take } m = -3/2 \text{ and } (x_1, y_1) = (2, 3).)$$

$$y = -\frac{3}{2}x + 3 + 3 \qquad (\text{Solve for } y.)$$

$$y = -\frac{3}{2}x + 6.$$

EXAMPLE 6 Write an equation for the line through $(-2, -1)$ and $(3, 4)$.

Solution We first calculate the slope and then use Eq. (11).

$$m = \frac{-1 - 4}{-2 - 3} = \frac{-5}{-5} = 1.$$

The (x_1, y_1) in Eq. (11) can be either $(-2, -1)$ or $(3, 4)$:

With $(x_1, y_1) = (-2, -1)$	With $(x_1, y_1) = (3, 4)$
$y - (-1) = 1 \cdot (x - (-2))$	$y - 4 = 1 \cdot (x - 3)$
$y + 1 = x + 2$	$y - 4 = x - 3$
$y = x + 1.$	$y = x + 1.$

Same result

Either way, $y = x + 1$ is an equation for the line (Fig. 1.26).