

2.1 Quadratic Equations - Quadratic Formula

Thursday, January 4, 2024 8:52 AM

المعادلة التربيعية

↳ general form
الشكل العام

$$ax^2 + bx + c = 0$$

أرقام

$a \neq 0$ b Constant

صباح الخير
↳

Exp write this equation in the general form and determine a, b, c

$$\textcircled{1} \quad 5x^2 - 4x = \cancel{2x^2} + 3x - 5$$

$-2x^2$ $-2x^2$

$$3x^2 - 4x = \cancel{3x} - 5$$

$-3x$ $\cancel{-3x}$

$$3x^2 - 7x = \cancel{-5}$$

$+5$ $\cancel{+5}$

$$3x^2 - 7x + 5 = 0$$

$$a=3, \quad b=-7, \quad c=5$$

$$\textcircled{2} \quad 3 - x^2 = \underline{8} - 3x + \underline{1}$$

$$3 - x^2 = \cancel{9} - 3x$$

-9 -9

$$-6 - x^2 = -\cancel{3x}$$

+3x +3x

$$-6 - x^2 + 3x = 0$$

$$-x^2 + 3x - 6 = 0$$

$$a = -1, b = 3, c = -6$$

Remark

$$ab = 0 \Rightarrow \begin{cases} a = 0 \\ \text{or} \\ b = 0 \end{cases}$$

Q. How to solve QE?

QE: Quadratic Equation

A. Two methods

- FM: Factoring Method
تحليل للعوامل
- QF: Quadratic Formula
القانون العام

معادلة التربيعية

→ Q4 : Quadratic form -
القانون العام

Exp Solve $(3x - 6)(2 - 4x) = 0$

we use FM

$$3x - 6 = 0$$

+6 +6

$$3x = 6$$

$$x = 2$$

$$2 - 4x = 0$$

-2 -2

$$-4x = -2$$

-4 -4

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

solution

Exp solve using Factoring (FM)

① $x^2 = 11x - 10$

$$x^2 - 11x + 10 = 0$$

$$(x - 1)(x - 10) = 0$$

$$x - 1 = 0$$

+1 +1

$$x = 1$$

$$x - 10 = 0$$

+10 +10

$$x = 10$$

solution

Check

$$x^2 = 11x - 10$$

$$(1)^2 \stackrel{?}{=} 11(1) - 10$$

$$1 = 1 \quad \checkmark$$

$$x^2 = 11x - 10$$

$$(10)^2 \stackrel{?}{=} 11(10) - 10$$

$$100 \stackrel{?}{=} 110 - 10$$

$$100 = 100 \quad \checkmark$$

solution

$$(2) \quad (y-3)(y+2) = -4$$

$$y-3 = -4 \quad \text{or} \quad y+2 = -4$$

$$y^2 + 2y - 3y - 6 = -4$$

$$y^2 - y - 6 = -4$$

$$y^2 - y - 2 = 0$$

$$(y-2)(y+1) = 0$$

$$y-2 = 0 \quad \text{or} \quad y+1 = 0$$

$$y = 2$$

$$y = -1$$

check

$$(y-3)(y+2) = -4$$

$$(2-3)(2+2) \stackrel{?}{=} -4$$

$$(-1)(4) \stackrel{?}{=} -4 \quad \checkmark$$

$$-4 = -4$$

$$(y-3)(y+2) = -4$$

$$(-1-3)(-1+2) \stackrel{?}{=} -4$$

$$(-4)(1) \stackrel{?}{=} -4$$

$$-4 = -4$$

$$ab = -2$$

$$a+b = -1$$

check $x = 12 \quad \checkmark$

من العام =

$$3x+6 \stackrel{?}{=} 0$$

$$3(12)+6 \stackrel{?}{=} 0$$

$$36+6 \neq 0$$

$$(3) \quad x \cdot \frac{x+1}{3x+6} = \frac{3 \cdot (x+6)}{x \cdot (3x+6)} + \frac{2x+6}{x(3x+6)}$$

$$\frac{x(x+1)}{x(3x+6)} = \frac{3(3x+6)}{x(3x+6)} + \frac{2x+6}{x(3x+6)}$$

$$3(12)+6 = 36+6 \neq 0$$

$$x = -2$$

هل هذا هو الجواب؟
صلى الله عليه وسلم

$$3x+6 \stackrel{?}{=} 0$$

$$3(-2)+6 \stackrel{?}{=} 0$$

$$0 = 0$$

$$x(3x+6)$$

$$\frac{x(x+1)}{x(3x+6)} = \frac{9x+18+2x+6}{x(3x+6)}$$

$$x(3x+6)$$

$$x(x+1) = 9x+18+2x+6$$

$$x^2+x = 11x+24$$

$$x^2-10x-24=0$$

$$x^2-10x-24=0$$

$$ab = -24$$

$$a+b = -10$$

$$(x-12)(x+2) = 0$$

$$x-12=0 \quad \text{or} \quad x+2=0$$

$$x = 12$$

$$x = -2$$

③ $x^2 - 7 = 9$

الكل، لا، لا

$-9 \quad -9$

$x^2 - 16 = 0$

$ab = -16$
 $a + b = 0$

$(x - 4)(x + 4) = 0$

$x - 4 = 0$ or $x + 4 = 0$
 $+4 \quad +4$ $-4 \quad -4$

$x = 4$

or

$x = -4$

Check

$x^2 - 7 = 9$

$4^2 - 7 = 9$ ✓

$(-4)^2 - 7 = 9$ ✓

كمان صح ✓

$x^2 - 7 = 9$
 $+7 \quad +7$

$\sqrt{x^2} = \sqrt{16}$

$|x| = 4$

$x = -4$ $x = 4$

$x = \pm 4$

④ $x^2 - 3 = 0$
 $+3 \quad +3$

$\Rightarrow \sqrt{x^2} = \sqrt{3}$

ملاحظة $x^2 - 3 = 0$

$(x - \sqrt{3})(x + \sqrt{3}) = 0$

$|x| = \sqrt{3}$

$x = \sqrt{3}$

$x = -\sqrt{3}$

$$(x - \sqrt{3})(x + \sqrt{3})$$

$$x - \sqrt{3} = 0, \quad x + \sqrt{3} = 0$$

$$x = \sqrt{3}$$

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

$$x = \sqrt{3}$$

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

$$x = \pm\sqrt{3}$$

5

$$3x^2 - 12 = 0$$

$$+12 \quad +12$$

$$\frac{3}{3}(x^2 - 4) = \frac{0}{3}$$

$$x^2 - 4 = 0$$

$$(x - 2)(x + 2) = 0$$

$$x - 2 = 0, \quad x + 2 = 0$$

$$x = 2$$

$$x = -2$$

$$\frac{3x^2}{3} = \frac{12}{3}$$

$$\sqrt{x^2} = \sqrt{4}$$

$$|x| = 2$$

$$x = 2$$

$$x = -2$$

$$x = \pm 2$$

$$6 \quad (3x - 4)^2 = 25$$

$$(3x)^2 + 2(3x)(-4) + (-4)^2 = 25$$

$$\sqrt{(3x-4)^2} = \sqrt{25}$$

$$|3x - 4| = 5$$

$$9x^2 - 24x + 16 = 25$$

-25 -25

$$9x^2 - 24x - 9 = 0$$

المعادلة العام

$$\begin{aligned} a &= 9 \\ b &= -24 \\ c &= -9 \end{aligned}$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a}$$

$$= \frac{-(-24) \pm \sqrt{900}}{2(9)}$$

$$x = \frac{24 \pm 30}{18}$$

$$x_1 = \frac{24+30}{18} = \frac{54}{18} = 3 \checkmark$$

$$x_2 = \frac{24-30}{18} = \frac{-6}{18} = -\frac{1}{3} \checkmark$$

$$|5x-11|$$

$$3x-4=5$$

+x +4

$$\frac{3x}{3} = \frac{9}{3}$$

$$x=3 \checkmark$$

$$3x-4=-5$$

+4 +4

$$\frac{3x}{3} = \frac{-1}{3}$$

$$x = -\frac{1}{3}$$

solution

$$\begin{aligned} \Delta &= b^2 - 4ac \\ &= (-24)^2 - 4(9)(-9) \\ &= 576 + 324 \\ &= 900 \end{aligned}$$