

L1 - Solving by Graphing/Factoring

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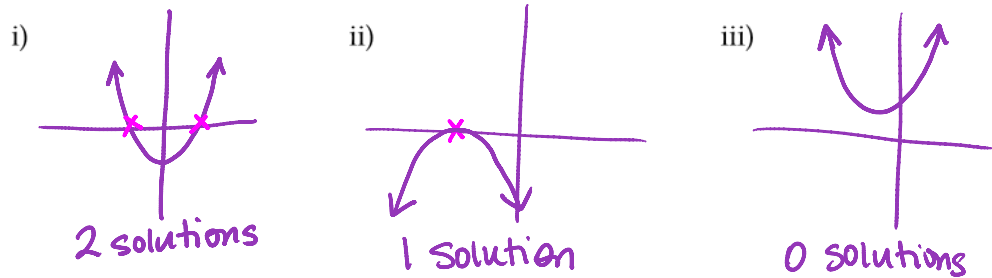
Quadratic Equations

Lesson 1 Solving Quadratic Equations by Factoring & Graphing

When the graph of a quadratic function $f(x) = ax^2 + bx + c$ intersects the x-axis, the x-coord of these points are considered the root(s) of its quadratic equation $ax^2 + bx + c = 0$.
 ↳ aka "zeros" ← Quad. Equation → "Solve"

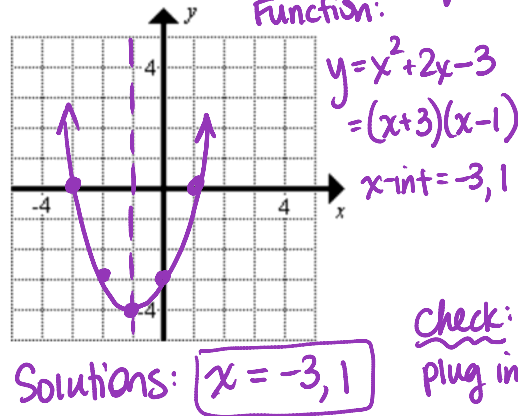
"Solutions" of any quadratic equation $ax^2 + bx + c = 0$ are called **roots** or **zeros** of the corresponding function. Graphically, they correspond to the x-intercepts (where $y = 0$).

Possible number of solutions:

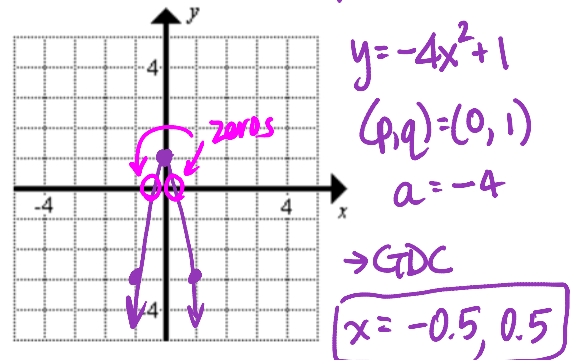


Eg1: Solve the quadratic equations again by graphing their corresponding functions.

a) $x^2 + 2x - 3 = 0$ → Corresponding Function:



b) $-4x^2 + 1 = 0$ → Corr. Func.



As seen with quadratic functions, we can also use factoring to find the roots of an equation.

Eg. 2: Solve the following quadratic equations by factoring. Check your solution(s).

a) $-4m^2 + 24m = 0$ ← must = 0 "zeros"

$-4m(m-6) = 0$ (Zero Product Property)

$-4m = 0$ → $m = 0$

$m - 6 = 0$ → $m = 6$

b) $x^2 - 6x + 9 = 0$

$(x-3)(x-3) = 0$

$x - 3 = 0$ → $x = 3$

c) $x^2 - 9x + 20 = 0$
 $(x-4)(x-5) = 0$
 $x = 4, 5$

d) $6x^2 - 17x + 12 = 0$
 $(\frac{6x-9}{3})(\frac{6x-8}{2}) = 0$
 $(2x-3)(3x-4) = 0$
 $2x-3=0 \Rightarrow x = \frac{3}{2}$
 $3x-4=0 \Rightarrow x = \frac{4}{3}$

e) $\frac{12x^2}{12} - \frac{48}{12} = 0$ GCF=12
 $x^2 - 4 = 0$
 $(x+2)(x-2) = 0$
 $x = -2, 2$

f) $a^2x^2 - 1 = 0$
 $(ax^2+1)(ax^2-1) = 0$
 $ax^2+1=0 \Rightarrow ax^2=-1 \Rightarrow x^2=-\frac{1}{a}$
 $ax^2-1=0 \Rightarrow ax^2=1 \Rightarrow x^2=\frac{1}{a}$
 $x = \pm \sqrt{-\frac{1}{a}}, a < 0$
 $x = \pm \sqrt{\frac{1}{a}}, a > 0$

Eg.3: Solve by factoring $12(x+2)^2 + 24(x+2) + 9 = 0$. Check your solution(s).

Let $a = x+2$
GCF=3
 $12a^2 + 24a + 9 = 0$
 $4a^2 + 8a + 3 = 0$
 $(4a+6)(4a+2) = 0$
 $(2a+3)(2a+1) = 0$
 $a = -\frac{3}{2} \quad a = -\frac{1}{2}$

But... $a = x+2$
 $\Rightarrow x = a-2$
 $x_1 = -\frac{3}{2} - 2 \quad x_2 = -\frac{1}{2} - 2$
 $x_1 = -\frac{7}{2} \quad x_2 = -\frac{5}{2}$

Eg.4: Write a quadratic equation whose roots are $-\frac{1}{2}$ and $\frac{4}{3}$ in general form $ax^2 + bx + c = 0$ where a, b and c are integers.

$x = -\frac{1}{2} \quad x = \frac{4}{3}$
 $2x = -1 \quad 3x = 4$
 $2x+1 = 0 \quad 3x-4 = 0$
 $(2x+1)(3x-4) = 0$
 $6x^2 - 5x - 4 = 0$

Homework: Worksheet: Solving Quadratics by Graphing & Factoring