WORKING WITH QUADRATIC FUNCTIONS: THE STANDARD, VERTEX & FACTORED FORM

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So far we worked w/ the vertex form (mainly): $f(x) = a(x-h)^2 + k$

Vertex form
Vertex is at (h,k)

Example: $f(x) = 3(x-1)^2 + 2 \Rightarrow$ Vertex: $(1,2)$

STANDARD FORM: $f(x) = ax^2 + bx + c$

Example: Write $f(x)$ above in Standard form. $f(x) = 3(x-1)^2 + 2 = 3(x-1)(x-1) + 2$

Solution: Expand the square & group terms

$= 3(x^2 + 1^2 - 2x) + 2 = 3(x^2 - x - x + 1) + 2$

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

$a = 3 \quad b = -6 \quad c = 3 \Leftarrow$

Practice: Find The standard for of $f(x)=2(x+3)^2-7$

Ans: $f(x)=2(x+3)^2-7=2(x+3)(x+3)-7=$

$=2(x^2+3x+3x+9)-7=2(x^2+6x+9)-7=$

$=2x^2+12x+18-7=\boxed{2x^2+12x+11}$

$a=2$

$b=12$

$c=11$

Solving Quadratic Equations.

- Examples of Quadratic Equations

- $4 = 100 - 4.9 \cdot t^2$ $\Rightarrow$ Standard Form $a = -4.9$, $b = 0$, $c = 100 - 4 = 96$
- $2x^2 + 3x + 1 = -8$ $\Rightarrow$ S.F. $a = 2$, $b = 3$, $c = 9$
- $3(x-1)^2 + 2 = x + 1$ $\Rightarrow$ Form? Cannot say right away
- $3(x+1)(x-2) = 0$ $\Rightarrow$ Factor Form

GENERAL SOLUTION FOR QUADRACTIC EQUATIONS IN STANDAR FORM

$a x^2 + bx + c = 0$

Always two (2) solutions given by formula

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

"Quadratic Formula"

It can be that both solutions are =!!

Example $x^2 - 2x + 1 = 0$ Solved:

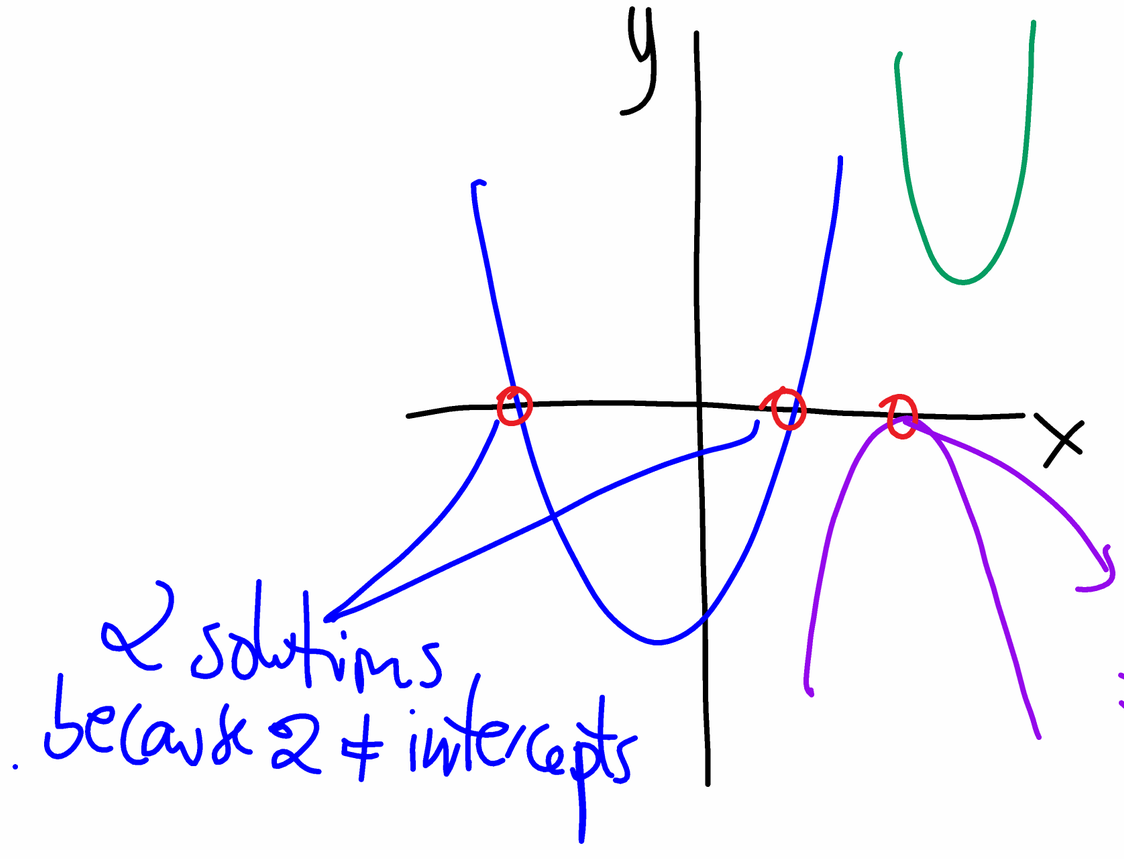
Ans: 1) Start by identifying a, b, & c

$a = 1 \quad b = -2 \quad c = 1$

2) Substitute these values in quadratic formula

$$X = \frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot 1}}{2 \cdot 1} = \frac{2 \pm \sqrt{4-4}}{2} = \frac{2 \pm 0}{2} = \begin{cases} \frac{2}{2} = 1 \\ \frac{2}{2} = 1 \end{cases}$$

GRAPHICAL INTERPRETATION OF THE SOLUTIONS OF A QUADRATIC EQUATION



2 solutions because 2 x-intercepts

only 1 intercept point
⇒ Hence, both solutions COINCIDE

THE SOLUTIONS GIVE US THE X-intercepts of the parabola

What happens with green parabola?

NO Intercept ⇒
Hence, NO solution

Example: $(x-2)^2+2=0$ Solve this

$x^2-2x+4+2=0$

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

$$x=\frac{2\pm\sqrt{4-24}}{2}=\frac{2\pm\sqrt{-20}}{2}$$

Squared of NEGATIVE # ⇓ NO SOLUTION