10/30/2023

so far... quadratic objects

FOIL

STANDARD

ax^2+bx+c

$a>0$ ∪

$a<0$ ∩

VERTEX

$a(x+h)^2+k$

vertex is at

$(-h, k)$

complete the square

- set $\boxed{h = b/2a}$

$\boxed{\begin{array}{l}k \text{ is from} \\ k = c - h^2\end{array}}$

FACTORED

$a(x-p)(x-q)$

x-int are at

$x=p$, $x=q$

$(p,0)$ $(q,0)$

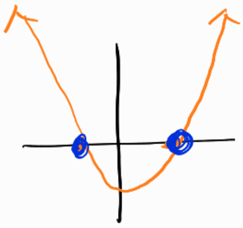
almost describes every quadratic...

almost all quad are factorable!

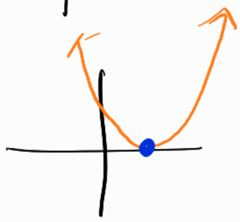
A quadratic is factorable when

discriminant $b^2-4ac \ \underline{?}\ 0$

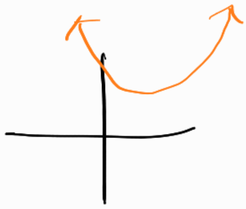
upshot: $f(x) = ax^2 + bx + c$



- $b^2-4ac > 0 \iff 2$ x-intercepts



$b^2-4ac = 0 \iff 1$ x-intercept



- $b^2-4ac < 0 \iff$ no x-intercepts

Compute discr. of

- $f(x) = 3x^2 - 5x + 2$

$25 - 4(3)(2) = 1 > 0$

So 2 x-int!

Where are the x-int tho?

use
- factoring (easiest)
- quadratic formula

$$\boxed{\begin{gathered} ax^2+bx+c=0 \\ \iff x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \end{gathered}}$$

using q-form... find x-int of

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

$a = 1$
$b = 2$
$c = -3$

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

$$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-3)}}{2(1)}$$

$$= \frac{-2 \pm \sqrt{4 + 12}}{2} = \frac{-2 \pm \sqrt{16}}{2}$$

$$x = \frac{-2 \pm 4}{2} \Rightarrow x = \frac{-2+4}{2}, \frac{-2-4}{2}$$

$$= 1, -3$$

$(1, 0), (-3, 0)$

Find x-int of

$2x^2 + 8x - 10$

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

$$x = \frac{-8 \pm \sqrt{64 - 4(2)(-10)}}{2(2)}$$

$$= \frac{-8 \pm \sqrt{64 + 80}}{4}$$

$= \frac{-8 \pm \sqrt{144}}{4} = \frac{(-8+12)}{4}$ $\frac{(-8-12)}{4}$

$= 4/4, \; -20/4$

$x = 1, -5$

$(1,0)$ & $(-5,0)$

Find x-int of

① $f(x) = 2x^2 - 5x + 2$

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

$x = \frac{5 \pm \sqrt{25 - 4(2)(2)}}{4} = \frac{5 \pm \sqrt{9}}{4} = \frac{5+3}{4}, \frac{5-3}{4}$

$\frac{5+3}{4} \to 2$, $\frac{5-3}{4} \to 1/2$

$(2,0), \; (1/2, 0)$

② For what x is

$x^2 = x + 1$

$-x-1 \quad -x-1$

$\Rightarrow x^2 - x - 1 = 0$

$\frac{1 + \sqrt{5}}{} \quad 1 - \sqrt{5}$

$$x = \frac{1+\sqrt{5}}{2}, \quad \frac{1-\sqrt{5}}{2}$$