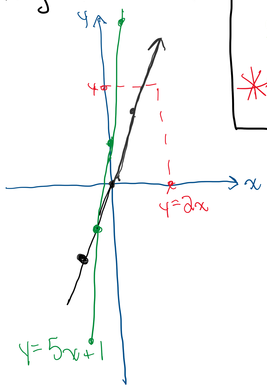
Math 1110H - Lesson 1 - Quadratic Review

Monday, September 11, 2023 7:55 AM

Today's Lecture

- Some precalc, algebra, trigonometry



Not algebra:

$\frac{a+b}{a+c} = \frac{b}{c}$

* ↳ does work when $a=0$ or $b=c$

POI

① $2x-x = 5x+1$

$\Rightarrow 5x-2x+1$

$0 = 3x \quad [3x+1=0]$

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

② $y = 2x$

$y = 2(-\frac{1}{3})$

$y = -\frac{2}{3}$

special

a b c d e f g h i j k l m n o p q r s t u v w x y z

primes | real variables

constants | integer variables | rational variables

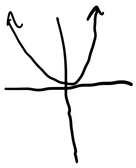
*various Greek Letters...

$\alpha, \beta, \Gamma, \delta, \theta, \eta, \theta, \ldots \pi$

(especially for angles!)

Parabola Review

$y = x^2$



$y = 2x^2+4x-1$

y-int ($x=0$) ⇒ ① $y = 2(0)^2+4(0)-1$

$y = -1$

x-int ($y=0$)

② $0 = 2x^2+4x-1$ ← cannot factor, use quadratic formula

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

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

$x = \frac{-4 \pm \sqrt{16+8}}{4}$

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

$x = -1 \pm \frac{2\sqrt{6}}{4}$

$x = -1 \pm \frac{\sqrt{6}}{2}$

④ $x = -1+\frac{\sqrt{6}}{2}$ $\quad x = -1-\frac{\sqrt{6}}{2}$

③ $\sqrt{24} = \sqrt{8\cdot 3} = \sqrt{4\cdot 2\cdot 3} = \sqrt{2\cdot 2\cdot 2\cdot 3} = 2\cdot\sqrt{6}$

⑤ Where is the tip of the parabola?

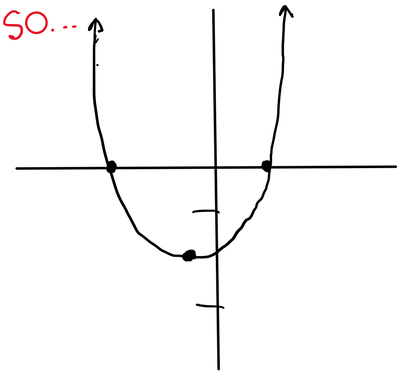
↳ halfway b/t the interce pt's!

plug x in

$x = -1$

$y = 2(-1)^2+4(-1)-1 = 3$

SO...



Complete the square

$(a \neq 0)$

① $y = ax^2+bx+c$

factor a out

$y = a\left(x^2+\frac{b}{a}x+\frac{c}{a}\right)$

② compare... $(x+k)^2 = x^2+2kx+k^2$

$2k = \frac{b}{a}$

$k = \frac{b}{2a}$

$y = a\left(\left[x+\frac{b}{2a}\right]^2 - \frac{b^2}{4a^2}+\frac{c}{a}\right)$

if a = +ve, opens up

if a = -ve, opens down

$y = x^2+\frac{b}{a}x+\frac{b^2}{4a^2}$

③ tip $x = \frac{-b}{2a}$ $\quad y = -\frac{b^2}{4a}+c$

④ $\Rightarrow a\left[x+\frac{b}{2a}\right]^2 = \frac{b^2}{4a}-c$

$\Rightarrow \left[x+\frac{b}{2a}\right]^2 = \frac{b^2}{4a^2}-\frac{c}{a}$

$\Rightarrow x+\frac{b}{2a} = \pm\sqrt{\frac{b^2}{4a^2}+\frac{c}{a}}$

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

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