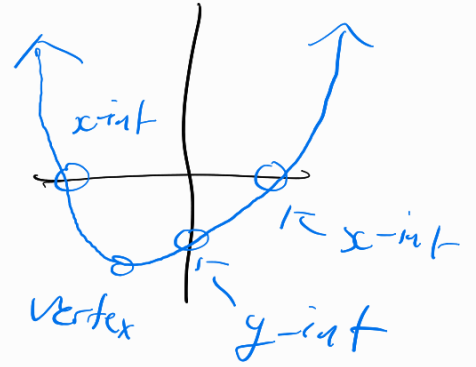


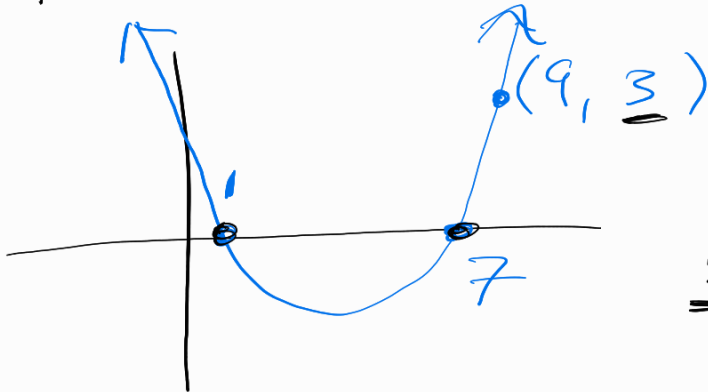
10/19/2023

$$f(x) = ax^2 + bx + c \longrightarrow$$



Now...

Graph $\longrightarrow f(x)$



Q: $f(x) = ax^2 + bx + c$
what's a, b, c ?

x-int: $x=1, x=7$

$$f(x) = a(x-1)(x-7)$$

\uparrow
need to solve a

$$f(9) = 3$$

$$\begin{aligned} f(9) &= a(9-1)(9-7) \\ &= a \cdot 8 \cdot 2 \\ &= 16a \end{aligned}$$

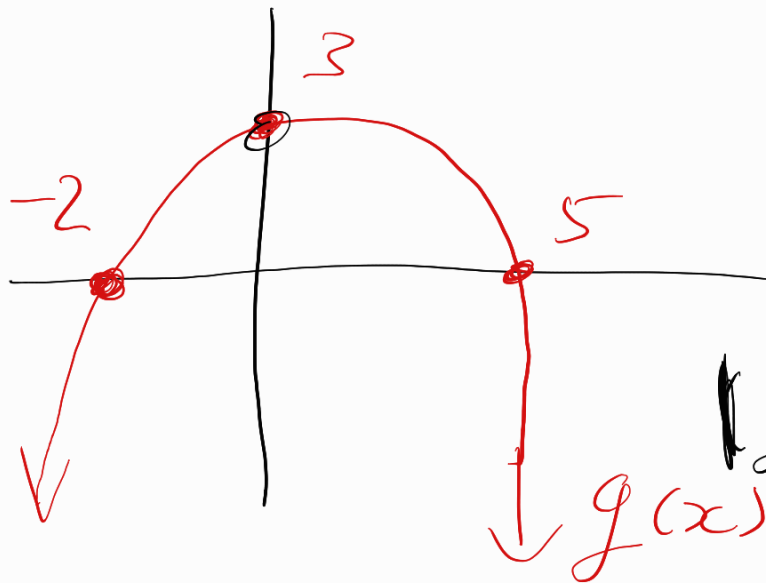
$$\Rightarrow 16a = 3 \Rightarrow$$

$$\boxed{a = \frac{3}{16}}$$

$$f(x) = \frac{3}{16} (x-1)(x-7)$$

$$= \frac{3}{16} (x^2 - 8x + 7)$$

$$= \frac{3}{16} x^2 - \frac{24}{16} x + \frac{21}{16}$$



$$g(x) = ax^2 + bx + c$$

$$x\text{-int: } -2, 5$$

$$g(x) = a(x+2)(x-5)$$

$$g(0) = a(0+2)(0-5) = -10a$$

$$g(0) = 3$$

$$-10a = 3 \Rightarrow a = -\frac{3}{10}$$

$$-\frac{3}{10} ((x+2)(x-5)) = -\frac{3}{10} (x^2 - 3x - 10)$$

$$= \left(-\frac{3}{10}x^2 + \frac{9}{10}x + 3 \right)$$

Quadratics have many forms:

• $ax^2 + bx + c \leftarrow$ "standard form"

• $(x+3)(x+2) \leftarrow$ "factored form"

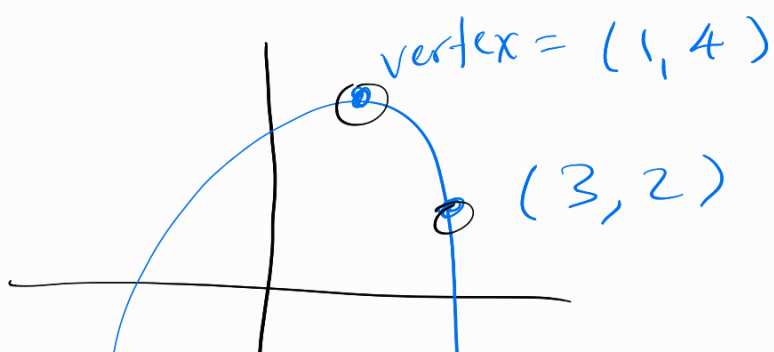
• $-3(\underline{x+1})^2 + \underline{5}$ "vertex form"

vertex \nearrow is $(-1, 5)$

• $20(x-5)^2 + 3$ vertex: $(5, 3)$

• $-7(2-x)^2 - 20$ vertex: $(2, -20)$

• $15(x+2)^2 - 5$ vertex: $(-2, -5)$



$$f(x) = \underline{a}x^2 + \underline{b}x + \underline{c}$$

$$f(x) = a(x - \underline{1})^2 + \underline{4}$$

$$\hookrightarrow f(3) = a(3 - 1)^2 + 4$$

$$\stackrel{!}{=} 4a + 4$$

$$f(3) = 2 \text{ from graph}$$

$$\Rightarrow 4a + 4 = 2$$

$$\quad \quad \quad -4 \quad \quad -4$$

$$4a = -2 \Rightarrow a = -\frac{1}{2}$$

$$f(x) = -\frac{1}{2}(x - 1)^2 + 4$$

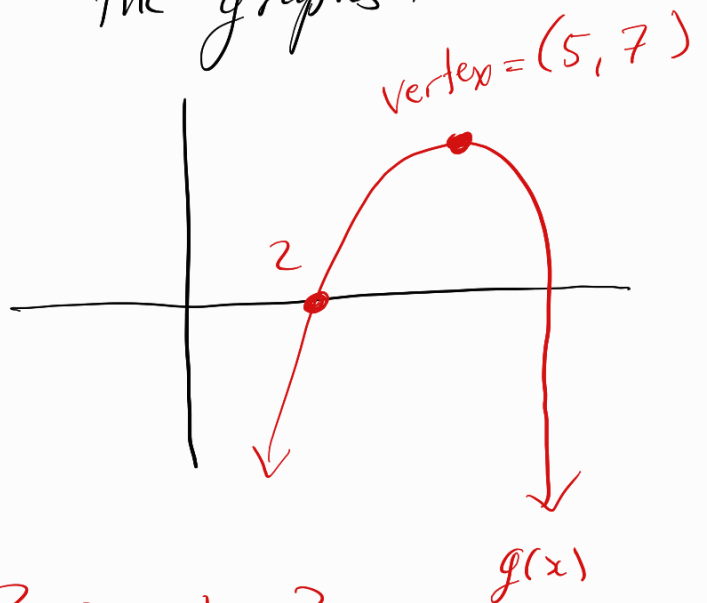
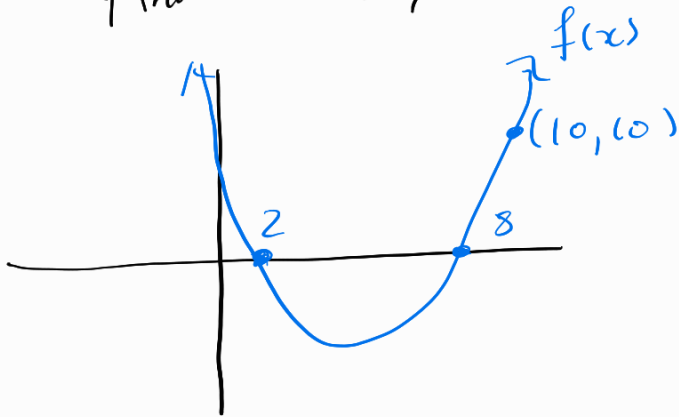
$$= -\frac{1}{2} [x^2 - 2x + 1] + 4$$

$$= -\frac{1}{2}x^2 + \underbrace{1x - \frac{1}{2} + 4}$$

3.5

$$(x+a)^2 = x^2 + 2ax + a^2$$

Find a, b, c from the graphs:



$$(x+a)^2 = x^2 + 2ax + a^2$$

complete the square

Standard
 $ax^2 + bx + c$

→ vertex form
 $a(\underline{x+h})^2 + k$

$x^2 + 10x + 21$ want vertex form!

$$(x+h)^2 = x^2 + \underline{2hx} + h^2$$

$$2h = 10 \Rightarrow \underline{h=5}$$

$$\rightarrow (x + 5)^2 + k$$

$$\underline{x^2 + 10x + 25 + k}$$

$$25 + k = 21 \Rightarrow k = -4$$

$$x^2 + 10x + 21 \Rightarrow \boxed{(x+5)^2 - 4}$$

vertex: $(-5, -4)$

$$g(x) = 1x^2 + 100x + 1$$

vertex form ???

$$\textcircled{1} \quad h = \frac{b}{2a} \Rightarrow h = 50$$

$$\underline{\underline{g(x) = (x + 50)^2}}$$

$$\textcircled{2} \quad h^2 = 50 \times 50 = 2500$$

$$\textcircled{3} \quad c = h^2 + k \rightarrow \text{solve for } k$$

$$1 = 2500 + k \Rightarrow k = -2499$$

$\textcircled{4}$ Answer!

$$g(x) = (x + 50)^2 - 2499$$

vertex: $(-50, -2499)$

Quadratic equations:

$$x^2 + \underline{10}x + \underline{21} = 0$$

$$(x+a)(x+b) = x^2 + (a+b)x + ab$$

Factoring

$$\underline{(x+3)} \underline{(x+7)} = 0$$

$$x+3=0$$

$$\Rightarrow x = -3$$

$$x+7=0$$

$$\Rightarrow x = -7$$

Factor

$a+b$



$a-b$



$$x^2 + 16x + \underline{15} = (x+15)(x+1)$$

$$x^2 - x - \underline{30} = (x-6)(x+5)$$

$$x^2 + 4x + \underline{3} = (x+1)(x+3)$$

$$x^2 - \underline{49} = (x+7)(x-7)$$

$$x^2 - 3x - 40 = (x-8)(x+5)$$

