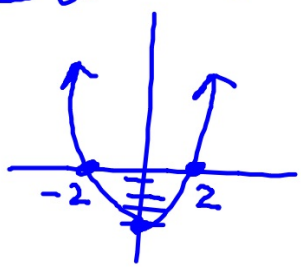
$$y = x^2 - 4$$

$$0 = x^2 - 4$$

$$4 = x^2$$

$$\pm 2 = x$$



$$0 = x^2 - 4$$

$$y = x^2 + 4$$

$$0 = x^2 + 4$$

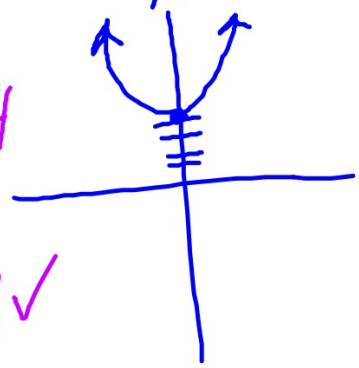
$$\sqrt{-4} = \sqrt{x^2}$$

$$\pm 2i = x$$

$$0 = x^2 + 4$$

$$0 = (2i)^2 + 4$$

$$0 = 4i^2 + 4 \checkmark$$



1.7: Completing the Square (CTS)

Quadratic Functions

$y = ax^2 + bx + c$ (standard form)

$y = a(x - h)^2 + k$ (vertex form)

$y = a(x - p)(x - q)$ (intercept form)

$x^2 - 10x + 25 = (x-5)^2$

$x^2 + 12x + 36 = (x+6)^2$

$9x^2 + 12x + 4 = (3x+2)^2$

perfect square trinomials

Write each quadratic function in vertex form.

a) $y = x^2 + 16x - 33$

$y = (x^2 + 16x + \underline{64}) \underline{-64} - 33$

$y = (x+8)^2 - 97$

$\left(\frac{16}{2}\right)^2 = 64$

1) rewrite with placeholders

2) CTS $\left(\frac{b}{2}\right)^2$

3) Factor the trinomial

4) Add/Subtract the CTS values

b) $y = x^2 - 6x + 19$

$y = (x^2 - 6x + \underline{9}) \underline{-9} + 19$

$y = (x - 3)^2 + 10$

$\left(\frac{-6}{2}\right)^2$

c) $y = x^2 + 7x + 2$

$$y = \left(x^2 + 7x + \frac{49}{4}\right) - \frac{49}{4} + 2$$

$$y = \left(x + \frac{7}{2}\right)^2 - \frac{41}{4}$$

$$\left(\frac{7}{2}\right)^2$$

$$-\frac{49}{4} + \frac{2 \cdot 4}{1 \cdot 4}$$

$$-\frac{49}{4} + \frac{8}{4}$$

d) $y = 4x^2 + 24x + 17$

$y = (4x^2 + 24x + \_\_\_)\ \_\_\_ + 17$

$y = 4(x^2 + 6x + 9) - 36 + 17$

$y = 4(x+3)^2 - 19$

$a \neq 1$

think more!

→ factor out "a"

e) $y = 6x^2 - 24x + 2$

$$y = 6(x^2 - 4x \underline{+4}) \underline{-24} + 2$$

$$y = 6(x-2)^2 - 22$$

f) $y = -x^2 + 8x - 4$

$$y = -1(x^2 - 8x + \underline{16}) \underline{+16} - 4$$

$$y = -1(x-4)^2 + 12$$

g) $y = 3x^2 - 4x + 1$

$$y = 3\left(x^2 - \frac{4}{3}x + \frac{4}{9}\right) - \frac{4}{3} + 1$$

$$y = 3\left(x - \frac{2}{3}\right)^2 - \frac{1}{3}$$

$$-\frac{4}{3} \div 2$$

$$-\frac{4}{3} \cdot \frac{1}{2}$$

$$-\frac{4}{6} \quad \left(-\frac{2}{3}\right)^2$$

Rewrite in vertex form, then sketch and state the domain and range. Include at least 3 points in the sketch.

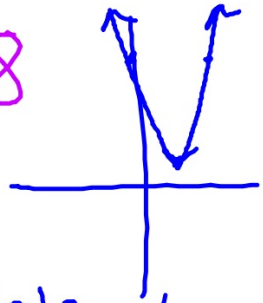
a) $y = 7x^2 - 14x + 8$

$y = (7x^2 - 14x + \_\_\_)\_\_\_ + 8$

$y = 7(x^2 - 2x + \underline{1})\underline{-7} + 8$

$y = 7(x-1)^2 + 1$

x	y
0	8
1	1
2	8



	set	interval
D:	$\{x \mid x \in R\}$	$(-\infty, \infty)$
R:	$\{y \mid y \geq 1\}$	$[1, \infty)$