

Q2: Solve $|\frac{1}{2}x - 1| = 3$

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

$$-\frac{1}{2}x - 1 = 3$$

+1 +1

$$-\frac{1}{2}x = 4$$

$$\div(-\frac{1}{2}) \div(-\frac{1}{2})$$

$$\boxed{x = -8}$$

Verify

$$|\frac{1}{2}(-8) - 1| = 3$$

$$|4 - 1| = 3$$

$$|3| = 3$$

Yes!

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

$$\frac{1}{2}x + 1 = 3$$

-1 -1

$$\frac{1}{2}x = 2$$

$$\div(\frac{1}{2}) \div(\frac{1}{2})$$

$$\boxed{x = 4}$$

Verify

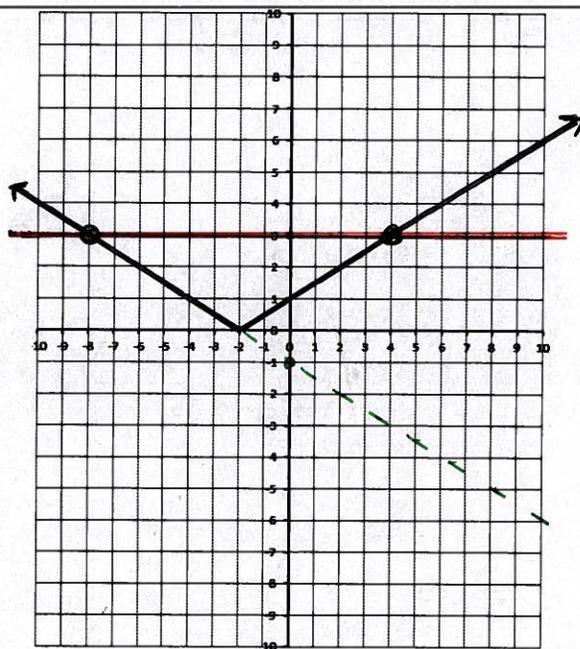
$$|\frac{1}{2}(4) - 1| = 3$$

$$|2 - 1| = 3$$

$$|1| = 3$$

Yes!

$$\boxed{\text{Sols are } x = -8, 4}$$



Q3: Solve $|x - 6| + 2 = 0$

$$|x - 6| = -2$$

$$+(x - 6) = -2$$

$$x - 6 = -2$$

+6 +6

$$\boxed{x = 4}$$

Verify!

$$|4 - 6| + 2 = 0$$

$$|-2| + 2 = 0$$

$$2 + 2 = 0$$

$$4 = 0$$

$$\boxed{\text{Nope!}}$$

$$-(x - 6) = -2$$

$$-x + 6 = -2$$

-6 -6

$$-x = -8$$

$$\div(-1) \div(-1)$$

$$\boxed{x = 8}$$

Verify!

$$|8 - 6| + 2 = 0$$

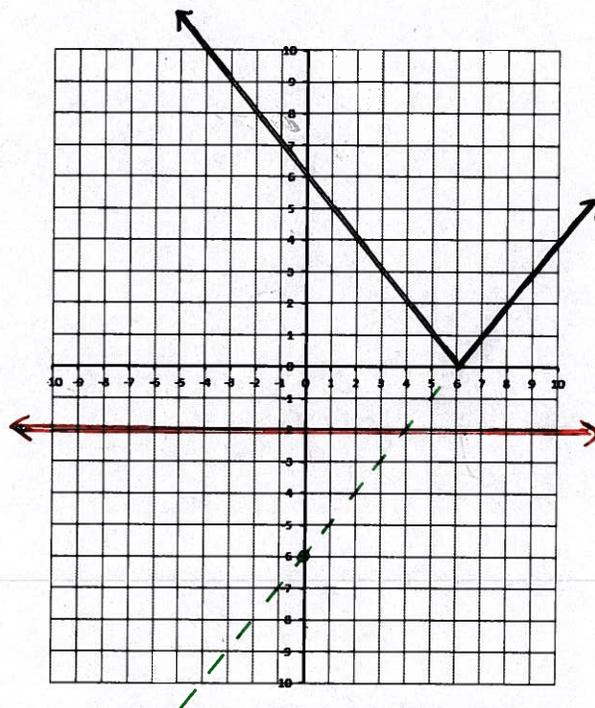
$$|2| + 2 = 0$$

$$2 + 2 = 0$$

$$4 = 0$$

$$\boxed{\text{Nope!}}$$

$$\boxed{\text{No Solutions!}}$$



Part 2 - Harder Absolute Value Equations

Q4: Solve $|x^2 + 4x - 6| = 6$

$$+(x^2 + 4x - 6) = 6$$

$$x^2 + 4x - 6 = 6$$

$$x^2 + 4x - 12 = 0$$

$$(x+6)(x-2) = 0$$

$$\boxed{x = -6}$$

$$\boxed{x = 2}$$

Verify

$$|(-6)^2 + 4(-6) - 6| = 6$$

$$|36 - 24 - 6| = 6$$

$$|6| = 6$$

Yes!

Verify

$$|2^2 + 4(2) - 6| = 6$$

$$|4 + 8 - 6| = 6$$

$$|6| = 6$$

Yes!

$$-(x^2 + 4x - 6) = 6$$

$$-x^2 - 4x + 6 = 6$$

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

$$-x(x+4) = 0$$

$$\boxed{x = 0}$$

$$\boxed{x = -4}$$

Verify

$$|0^2 + 4(0) - 6| = 6$$

$$|-6| = 6$$

Yes!

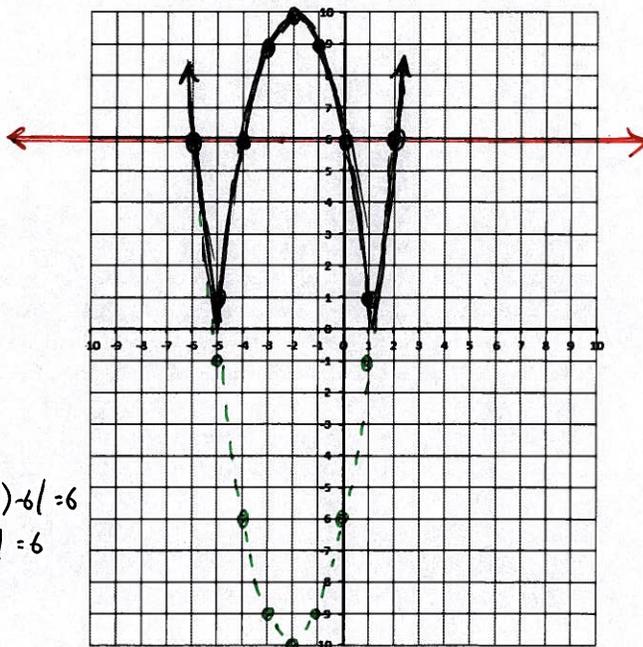
$$|(-4)^2 + 4(-4) - 6| = 6$$

$$|16 - 16 - 6| = 6$$

$$|-6| = 6$$

Yes!

Solns are $x = -6, -4, 2, 0$



Q5: Solve $|\frac{1}{2}x^2 + 2x + 2| = x - 2$

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

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

$$\frac{1}{2}x^2 + x + 4 = 0$$

TIMES BY -2

$$x^2 - 2x - 8 = 0$$

$$(x-4)(x+2) = 0$$

$$\boxed{x = 4}$$

$$\boxed{x = -2}$$

Verify!

Verify!

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

$$|10 + 8 + 2| = 2$$

$$|20| = 2$$

Yes!

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

$$-\frac{1}{2}x^2 - 2x - 2 = x - 2$$

$$-\frac{1}{2}x^2 - 3x + 0 = 0$$

TIMES BY 2

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

$$x(x-6) = 0$$

$$\boxed{x = 0}$$

$$\boxed{x = 6}$$

Verify!

Verify!

$$|\frac{1}{2}(0)^2 + 2(0) + 2| = (0) - 2$$

$$|2| = -2$$

Nope!

$$|\frac{1}{2}(6)^2 + 2(6) + 2| = (6) - 2$$

$$|18 + 12 + 2| = 4$$

$$|32| = 4$$

$$|4| = 4$$

Yes!

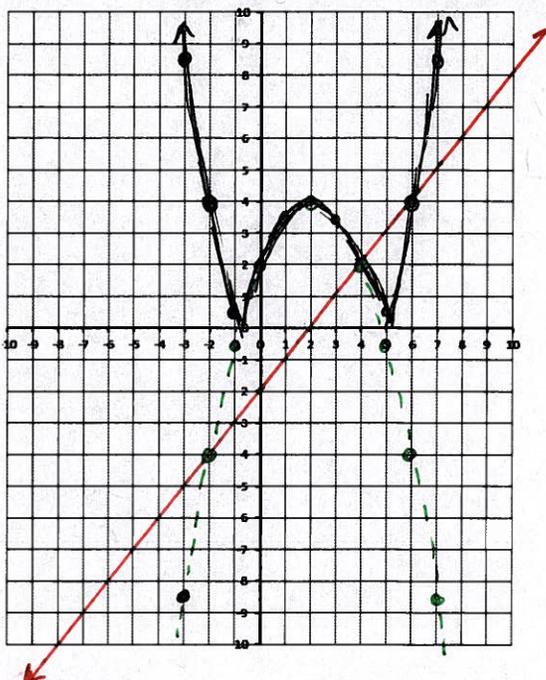
$$|\frac{1}{2}(-2)^2 + 2(-2) + 2| = (-2) - 2$$

$$|-2 - 4 + 2| = -4$$

$$|-4| = -4$$

Nope!

Solns are $x = 4, 6$



Q6: Solve $|-x^2 + 4x + 5| = -x^2 - 6x - 1$

$$+(-x^2 + 4x + 5) = -x^2 - 6x - 1$$

$$-x^2 + 4x + 5 = -x^2 - 6x - 1$$

$$+x^2 + 6x + 1 \quad +x^2 + 6x + 1$$

$$10x + 6 = 0$$

$$\quad -6 \quad -6$$

$$10x = -6$$

$$\div 10 \quad \div 10$$

$$\textcircled{A} \boxed{x = -\frac{3}{5}}$$

Verify!

$$-(-x^2 + 4x + 5) = -x^2 - 6x - 1$$

$$x^2 - 4x - 5 = -x^2 - 6x - 1$$

$$+x^2 + 6x + 1 \quad +x^2 + 6x + 1$$

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

$$\div 2 \quad \div 2 \quad \div 2 \quad \div 2$$

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

$$(x+2)(x-1) = 0$$

$$\textcircled{B} \boxed{x = -2}$$

Verify!

$$\textcircled{C} \boxed{x = 1}$$

Verify!

$$\textcircled{A} | -(-\frac{3}{5})^2 + 4(-\frac{3}{5}) + 5 | = -(-\frac{3}{5})^2 - 6(-\frac{3}{5}) - 1$$

$$| -\frac{9}{25} - \frac{12}{5} + 5 | = -\frac{9}{25} + \frac{18}{5} - 1$$

$$| \frac{56}{25} | = \frac{56}{25}$$

Yes! $x = -\frac{3}{5}$ is a solution.

$$\textcircled{B} | -(-2)^2 + 4(-2) + 5 | = -(-2)^2 - 6(-2) - 1$$

$$| -4 - 8 + 5 | = -4 + 12 - 1$$

$$| -7 | = 7$$

Yes! $x = -2$ is a solution!

$$\textcircled{C} | -(1)^2 + 4(1) + 5 | = -(1)^2 - 6(1) - 1$$

$$| -1 + 4 + 5 | = 1 - 6 - 1$$

$$| 8 | = -6$$

Nope!

$$\boxed{\text{Soln is } x = -2, -\frac{3}{5}}$$

