Key

Absolute Value: A1, R2

Absolute value is always positive (ex. distance).

Absolute value:

- **graph the original function**
  - ***linear, use $y = mx + b$**
  - ***quadratic, use $y = a(x - h)^2 + k$**
- **at the x-intercept, reflect the graph back into the positive (no negative values allowed)**
- **when writing in piecewise notation, must consider positive and negative cases**

$$y = \begin{cases} postive\ case, when\ x \ldots \\ negative\ case, when\ x \ldots \end{cases}$$

- **when solving algebraically:**
  - **isolate the absolute value**
  - **solve the positive case**
  - **solve the negative case**
  - **check for extraneous roots**

Graphing Absolute Value using Transformations

- $y = a|x - h| + k$
- **Same transformations as a quadratic function, different parent graph**
- **"V" Shape**

1. Evaluate: $2|3 - 5| + |1 - 4|$

$2|-2| + |-3|$

$2(2) + 3$

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2. Write in piecewise notation: $y = |2x + 6|$

$$y = \begin{cases} 2x+6 & x \geq -3 \\ -2x-6 & x < -3 \end{cases}$$

3. Write in piecewise notation: $y = |x^2 - 4|$

$$y = \begin{cases} x^2-4 & x \leq -2 \cup x \geq 2 \\ -x^2+4 & -2 < x < 2 \end{cases}$$

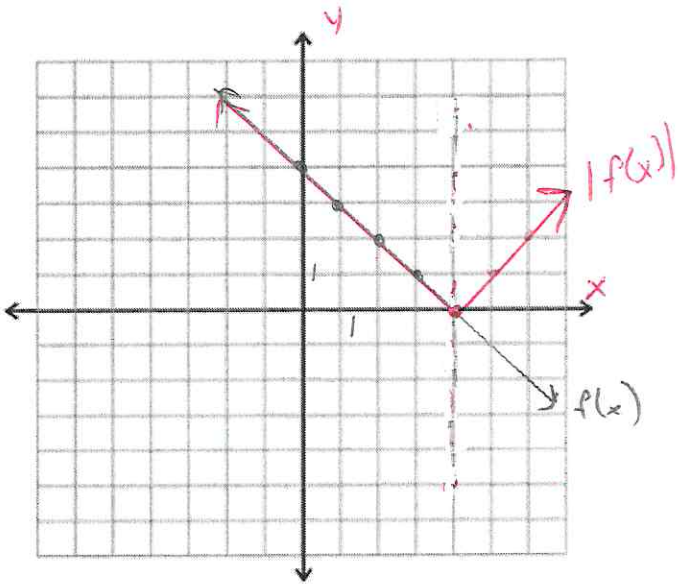
4. a) Sketch the graph of $f(x) = -x + 4$

b) On the same graph, sketch: $y = |f(x)|$

c) Determine the domain and range of $y = |f(x)|$.

Domain: $x \in \mathbb{R}$

Range: $y \geq 0$



5. a) Sketch the graph of $f(x) = (x-4)^2 - 2$

b) On the same graph, sketch: $y = |f(x)|$

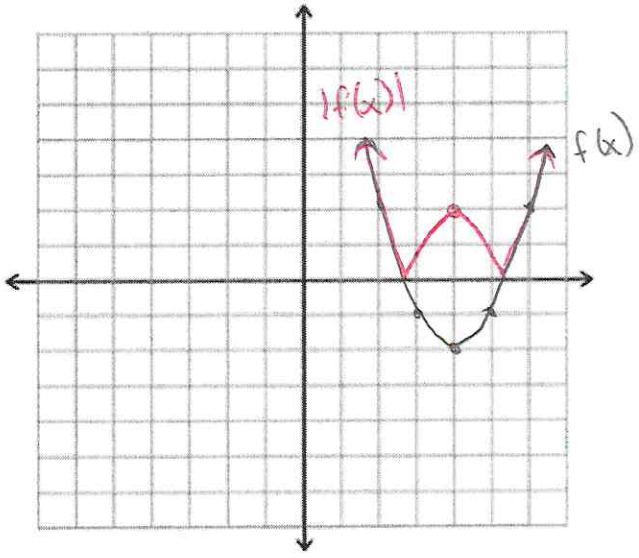
c) Determine the critical points.

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

$(x-4)^2 = 2$

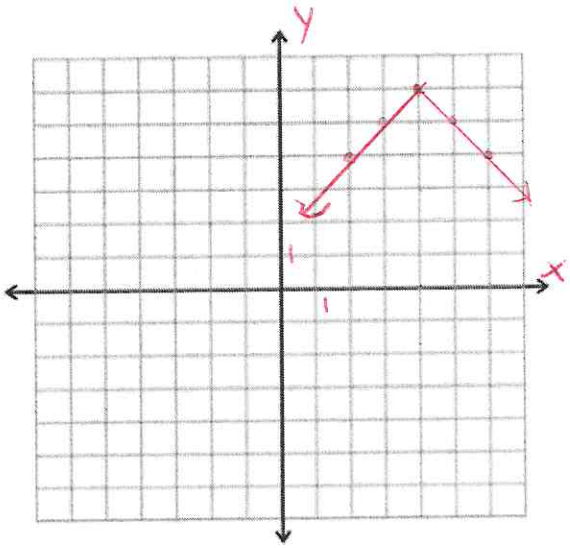
$x - 4 = \pm\sqrt{2}$

$x = 4 \pm \sqrt{2}$

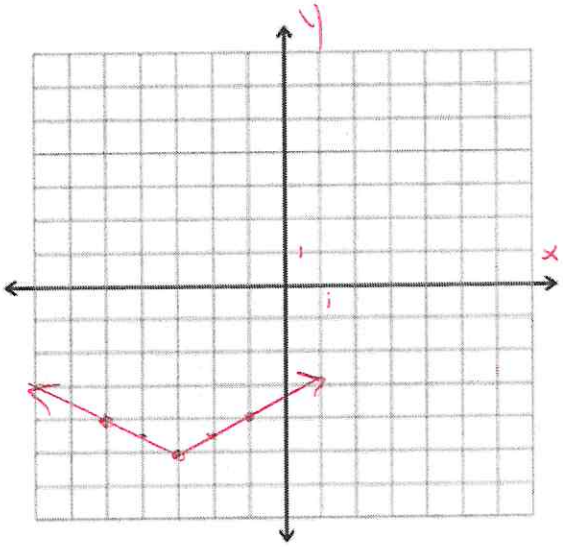


6. Graph the following using transformations. Label **TWO** points on the final graph!!

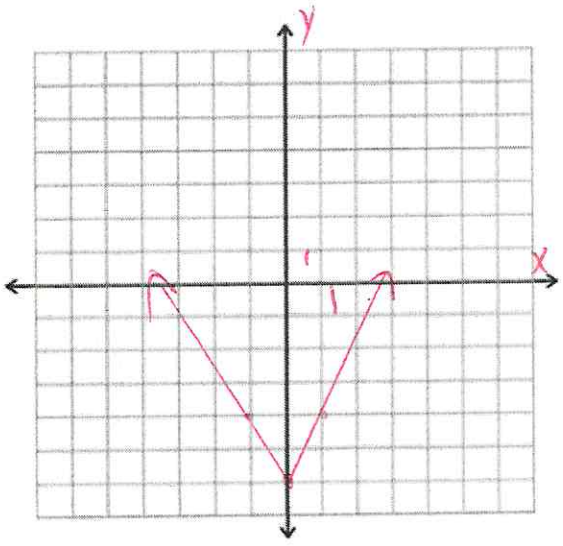
a) $y = -|x - 4| + 6$



b) $y = \frac{1}{2}|x + 3| - 5$



c) $y = 2|x| - 6$



7. Solve both graphically and algebraically: $|3x - 6| = 3$

$3x-6=3$ or $-(3x-6)=3$

$3x=9$ $\quad 3x-6=-3$

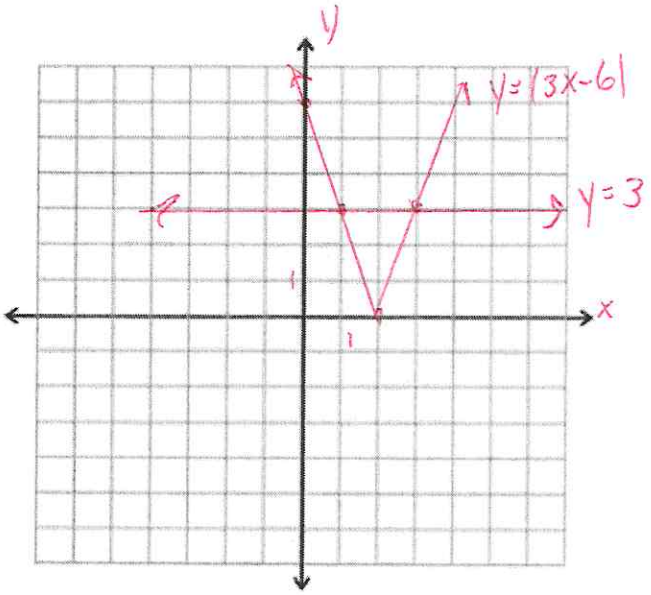
$x=3$ $\quad 3x=3$

$x=1$

sol'n

$x=1, 3$

check on graph



8. Solve the following equations algebraically. **Don't forget to CHECK your answer.**

a) $2 - 5|5m - 5| = -73$

$-5|5m-5| = -75$

$|5m-5| = 15$

$5m-5=15$ or $-(5m-5)=15$

$5m=20$ $\quad 5m-5=-15$

$m=4$ $\quad 5m=-10$

$m=-2$

check

$2-5|5(4)-5| = -73$

$2-5|15| = -73$

$-73=-73$ ✓

$2-5|5(-2)-5| = -73$

$2-5|-15| = -73$

$2-5(15) = -73$

$-73=-73$ ✓

b) $|x^2 - 2x + 2| = 3x - 4$

$x^2 - 2x + 2 = 3x - 4$

$x^2 - 5x + 6 = 0$

$(x-2)(x-3) = 0$

$x = 2 \quad x = 3$

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

$x^2 - 2x + 2 = -3x + 4$

$x^2 + x - 2 = 0$

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

~~$x = -2$~~ rej ~~$x = 1$~~ rej

check

$|2^2 - 2(2) + 2| = 3(2) - 4$

$2 = 2$ ✓

$|3^2 - 2(3) + 2| = 3(3) - 4$

$5 = 5$ ✓

$|(-2)^2 - 2(-2) + 2| \neq 3(-2) - 4$

$10 \neq -10$

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

$1 \neq -1$