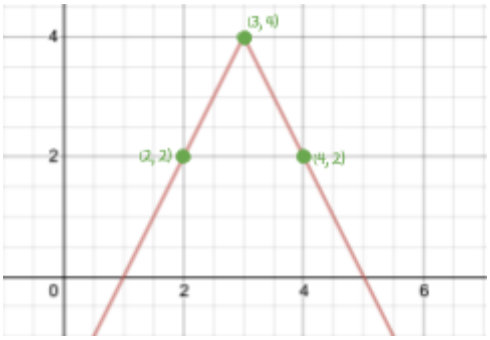
-- Absolute Value and Piecewise Functions --

Absolute Functions

Graphing

graph $f(x) = -2|x-3|+4$

1. find the vertex → x-value = opposite of what is being added to x, y-value = number being added to everything: (3, 4)
2. find points directly to the right and left of the vertex → plug in $x_{vertex}-1$ & $x_{vertex}+1$ into equation to find y-values, they should be the same number: (2,2) (4, 2)
3. plot the points on the graph. draw two straight lines from the vertex through the two points



Solving Equations

solve the equation $4|2x-1|-2=34$

1. isolate the absolute value bars from the other terms in the equation

$4|2x-1| = 36$

$|2x-1| = 9$

2. set up two different equations. write the green numbers on one side of both equations, removing the absolute value sign in the process.

$2x-1 =$ $\quad$ $2x-1 =$

3. take the red number and put it on the other side of one of your two equations. then multiply that number by -1 and place on other side of the remaining equation

$2x-1=9$ $\quad$ $2x-1=-9$

4. solve both equations for x

$x=5$ $\quad$ $x=-4$

5. mentally plug the numbers back into og equation to check your work and make sure they're not extraneous solutions

Solving Inequalities

solve the inequality $7-3|4x+7|<-2$

1. isolate the absolute value bars from the other terms in the inequality. remember to flip the sign when dividing by a negative

$-3|4x+7|<-9 \rightarrow |4x+7|>3$

2. you're going to write two inequalities. for the first one, write the inequality as is. for the second one, flip the sign and multiply the red number by -1. make sure to remove the absolute value bars

$4x+7>3$ $\quad$ $4x+7<-3$

3. solve both equations for x

$x>-1$ $\quad$ $x<-10/4$

4. write your domain. make sure to use brackets if the sign includes the equal bar

$(-\infty, -5/2) \cup (-1, \infty)$

5. mentally plug a number that fits the domain back into og equation to check your work and make sure they're not extraneous solutions

Piecewise Functions

Story → Function

Karen is renting a car for her family. In order to prevent any future problems, Kevin writes a piecewise function to explain to her how the pricing works. Basically, she pays $20 upfront, and there are no extra charges unless she drives the car more than 30 miles. After 30 miles, Kevin will charge $1 for every extra mile driven. What's the piecewise function that Kevin wrote for Karen ?

1. Identify the intervals that you are working with. In this case, the intervals are $0 < x \leq 30$ and $x > 30$ since the way the price is calculated differs between those two intervals.
2. treat the two intervals as two different situations. write the equations associated with each situation

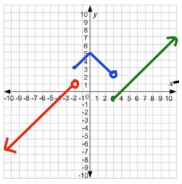
situation 1: Karen drives less than 30 miles: $f(x) = 20$

situation 2: Karen drives more than 30 miles: $f(x) = 1x + 20$

3. write your equations as a piecewise function

$$f(x) = \begin{cases} 20 & 0 < x \leq 30 \\ 1x+20 & x > 30 \end{cases}$$

Graph → Function



1. Identify where the function changes, set up your inequalities based on that
2. For each interval, find the equation that matches the segment in that interval. Then write your function

$$f(x) = \begin{cases} x+3 & x < -2 \\ -|x|+5 & -2 \leq x < 3 \\ x-4 & x \geq 3 \end{cases}$$

Function → Graph

$$f(x) = \begin{cases} x+3 & x < -2 \\ -|x|+5 & -2 \leq x < 3 \\ x-4 & x \geq 3 \end{cases}$$

1. Graph by interval. Start with the first one and graph the equation over that interval. Then move on to the others. Make sure to use an open circle if not equal and closed circle is equal