Section 3.3 Graphs of Nonlinear Inequalities

Begin to solve these problems by treating them as equalities and compare to their parent graph.

Ex. $y \geq (x-4)^3 - 2$

The parent function is $y = x^3$ and it has a translation to the right of 4 and downward by 2.

select values for x and determine the correspondi values for y.

When graphing the ordered pairs, get enough points to have a clear graph.

If the equation has an equal sign then use a solid line for the graph. If the equation does not have an equal sign then use a dotted line.

select a point not on the graph and place it into th function. If the outcome is true, then shade towa the point. If it is not true, then shade away from the point.

Ex: $y \leq 2 + |x-3|$ → $y \leq |x-3| + 2$

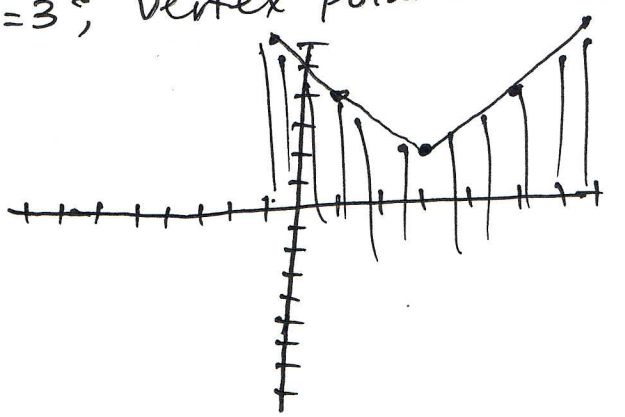
(a) Parent graph is $y = |x|$

(b) Translations of 3 right and 2up exist

(c) Let $x-3=0$ → $x=3$; Vertex point is (3,2)

(d)

x	f(x)
3	2
1	4
-1	6
5	4
7	6



Does (0,0) wo
yes
Graph down

Special Problem

When solve absolute value problems that involve only one variable, use the definition of absolute value to determine the solution set.

If $a < 0$ then $|a| = -a$

If $a \geq 0$ then $|a| = a$

Example $|x-2| - 5 < 4$ $\quad a = (x-2)$

Let a be (-)

$-(x-2) - 5 < 4$

$-x + 2 - 5 < 4$

$-x - 3 < 4$

$-x < 3 + 4$

$-x < 7$

$x > -7$

Let a be (+)

$(x-2) - 5 < 4$

$x - 7 < 4$

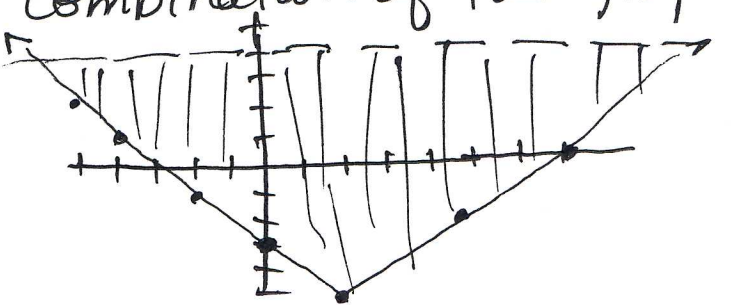
$x < 4 + 7$

$x < 11$

solution set for x:

$-7 < x < 11$

If we take the function $|x-2| - 5$ and set it equa to y we get $y = |x-2| - 5$. If we use the values of -7 and 11 for x, we see that for the inequality of $y < |x-2| - 5$ the outcome is $y < 4$. This graph is an upper boundary to the graph. The final graph is the combination of the graphs $y = |x-2| - 5$ and $y < 4$.



x	y
2	-5
0	-3
5	-2
-2	-1
-4	1
-5	2

x	
7	

13. $y < x^3 - 4x^2 + 2$ $(1,0)$ Is this point true for this inequality?

$0 < 1^3 - 4(1)^2 + 2$

$0 < 1 - 4 + 2$

$0 < -1$ False

17. $y \leq \frac{x^2 - 6}{x}$ $(-6,-9)$ Is this point true for this inequality?

$-9 \leq \frac{(-6)^2 - 6}{-6}$

$-9 \leq \frac{36 - 6}{-6}$

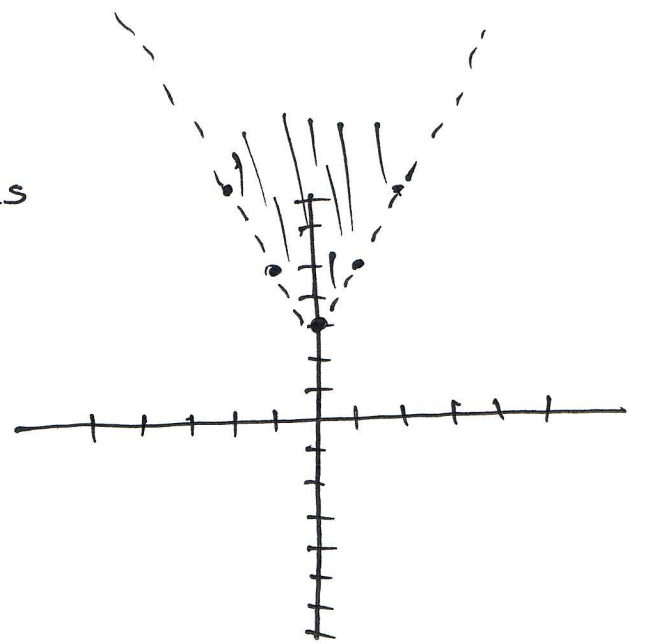
$-9 \leq \frac{30}{-6}$

$-9 \leq -5$ True

23. Graph each inequality $y > |2x| + 3$

parent graph is $y = |x|$
dilation of 2
translation up of 3
vertex $(0,3)$
not equality, so use dotted lines

x	y
0	3
-1	5
1	5
-2	7
2	7



Does $(0,0)$ work? $0 > 0 + 3$
$0 > 3$ False - shade away from $(0,0)$