Chapter 8 - 11PC

8.1 Absolute Value graphs

* remember $|\ |$ means has to be +

Same idea with graphing.

original graph $\Rightarrow$ absolute value

* | all y values |

linear

$y = x$

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

$\Rightarrow$

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

* note x intercepts are the same!

original graph $\Rightarrow$ absolute value

quadratic

$y = x^2 - 4$

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

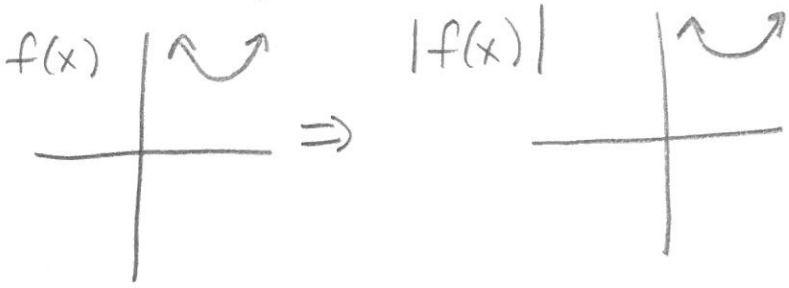
$\Rightarrow$ (|y|)

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

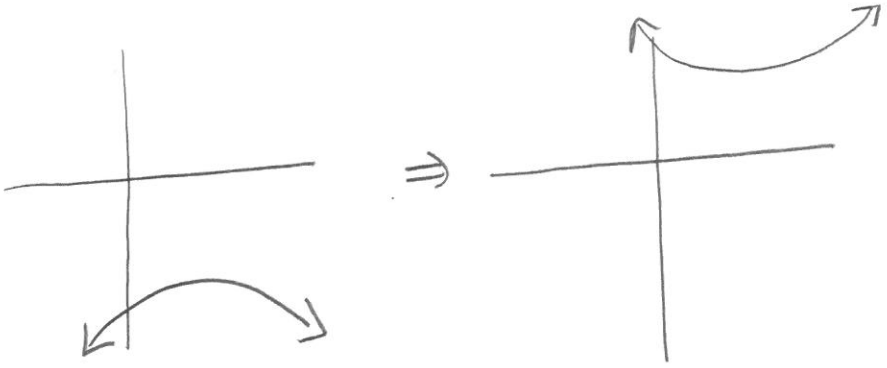
$y = |x^2 - 4|$

* note x intercepts are the same!

Other quadratic examples:



* stays the same because no negative values.



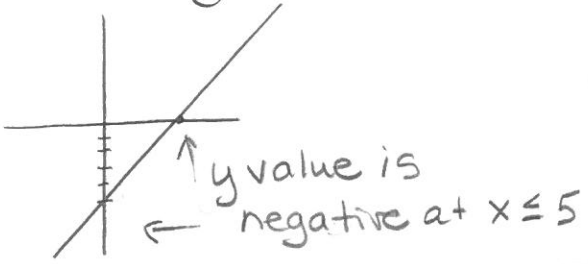
* all y values turn positive because all were negative.

Piece wise notation:

use a graph

① look at graph sketch
② determine at what x point that the y value changes signs.

ex $y = |x-5|$



$$y = \begin{cases} 2x-1 & \text{if } x \geq 5 \\ -(2x-1) & \text{if } x < 5 \end{cases}$$

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use the equation

① find out when formula = 0

$\underline{\underline{a + \frac{1}{2} \Rightarrow y = 0}}$

(*remember + slope m, - slope)

ex $y = |2x-1|$

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

$$y = \begin{cases} 2x-1 & \text{if } x \geq \frac{1}{2} \\ -(2x-1) & \text{if } x < \frac{1}{2} \end{cases}$$

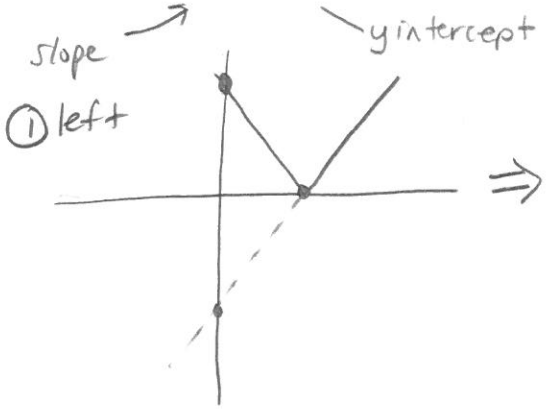
8.2 Solve absolute value Equations

by graphing

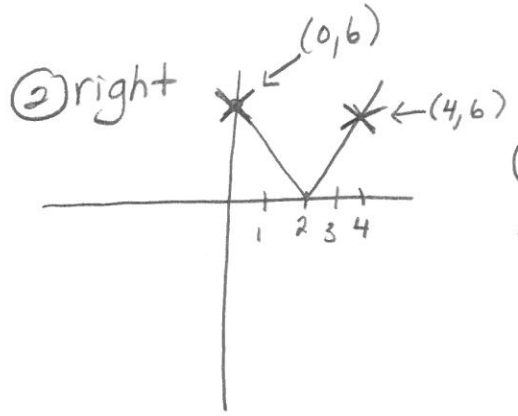
① graph line or point on left side
② graph line or point on right side
③ find out where they cross & name the points.

ex $|3x-6| = 6$

slope → $3x$; -6 ← y intercept



$\Rightarrow$



③ $x = 0$ and $x = 4$

$$|3x-6| = 6$$

using algebra

make (+)

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

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

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

make (−)

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

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

$$\frac{-3x}{-3} = \frac{0}{-3}$$

$$x = 0$$

ex 2

$$|3x+1| = x-4$$

⊕ ⊖

$+(3x+1) = x-4$

$3x+1 = x-4$

$-x \quad -1 \quad -x \quad -1$

$2x = -5$

$x = -5/2$

$-(3x+1) = x-4$

$-3x-1 = x-4$

$-x \quad +1 \quad -x \quad +1$

$-4x = -3$

$x = 3/4$

* plug back in to make sure the answers work!

$-5/2$

$\left|3\left(\frac{-5}{2}\right)+1\right| = \frac{-5}{2} - 4$

$\left|\frac{-15}{2}+1\right| = \frac{-13}{2}$

$\left|\frac{-13}{2}\right| \neq \frac{-13}{2}$

doesn't work

$3/4$

$\left|3\left(\frac{3}{4}\right)+1\right| = \left(\frac{3}{4}\right) - 4$

$\left|\frac{13}{4}\right| \neq \frac{-13}{4}$

doesn't work

* ∴ lines don't cross

Graphing a reciprocal:

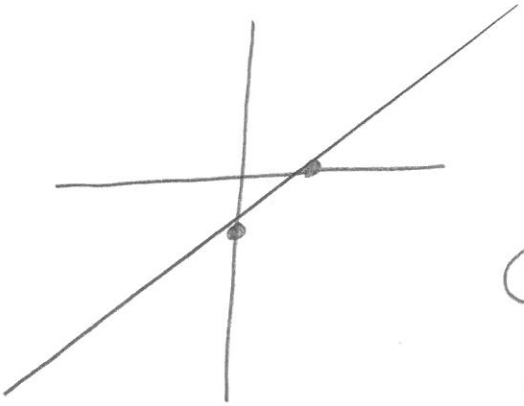
① find the asymptote (x intercept) by making $y=0$; $y=0$ is 2nd asymptote.

② find where $y=1$ and $y=-1$ & put a dot on both points

③ curve around asymptote

linear

ex $y = x-2 \Rightarrow$ reciprocal $\Rightarrow y = \frac{1}{x-2}$

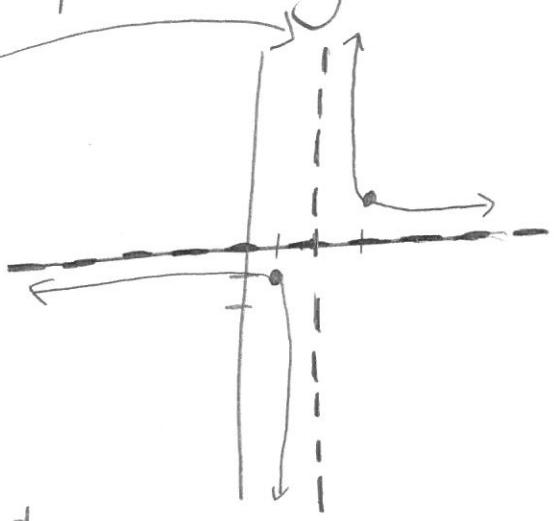


① asymptote at $x=2$ ($y=0$ at $x=2$)

② $y=-1$ at $x=1$

and $y=+1$ at $x=3$

③ curve around asymptotes



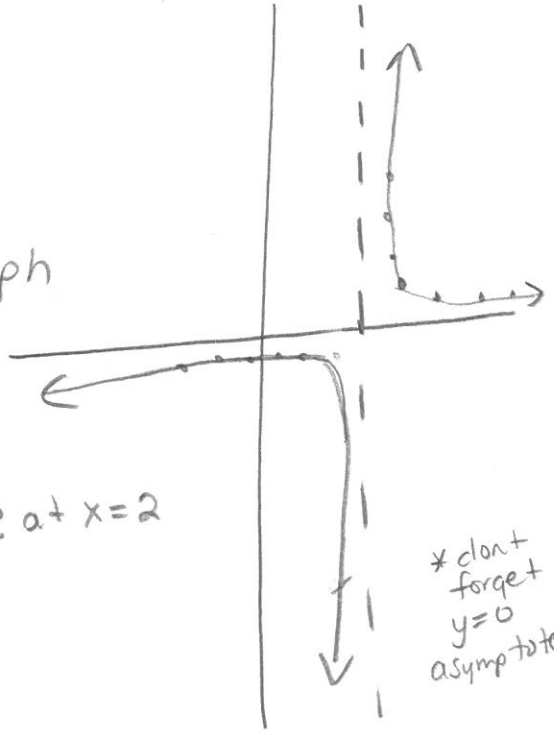
Using a table of values

$y = x-2$ → reciprocal → $y = \frac{1}{x-2}$

x	y
-4	-6
-3	-5
-2	-4
-1	-3
0	-2
1	-1
2	0
3	1
4	2

x	$\frac{1}{y}$ ← *
-4	$-\frac{1}{6}$
-3	$-\frac{1}{5}$
-2	$-\frac{1}{4}$
-1	$-\frac{1}{3}$
0	$-\frac{1}{2}$
1	-1
2	$\frac{1}{0}$ = asymptote at $x=2$
3	1
4	$\frac{1}{2}$

⇒ graph



* don't forget $y=0$ asymptote

Graphing a Reciprocal

Quadratic

① find asymptotes (x intercepts) by factoring or quadratic formula
* dont forget $y=0$ is also an asymptote

② find where $y=1$ and $y=-1$ on original equation (use graph of orig)

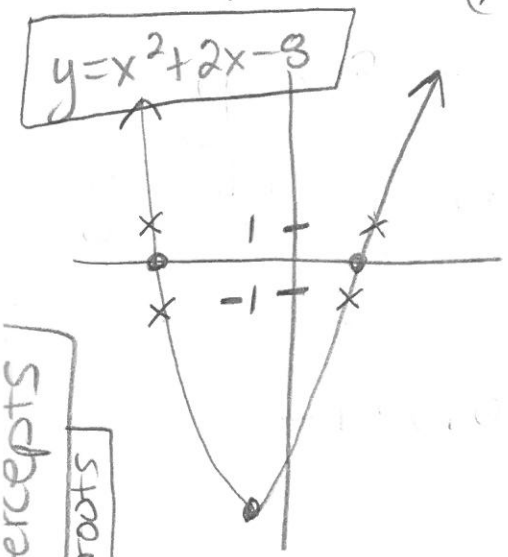
③ reciprocal the vertex

ex

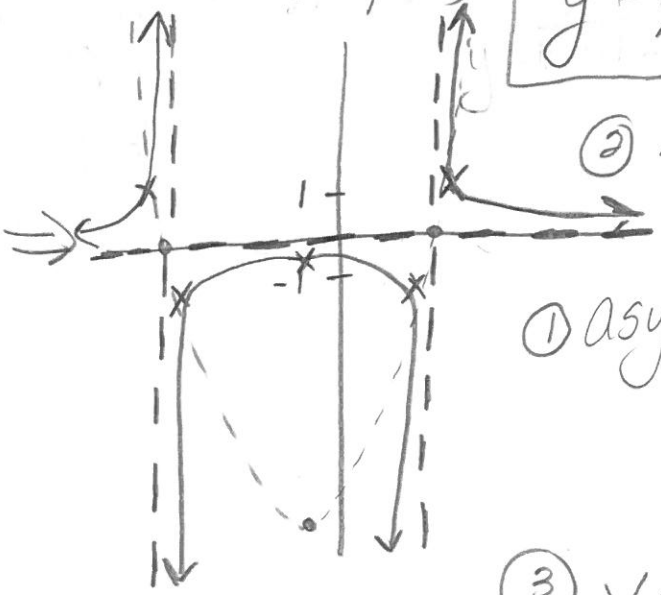
$y = x^2 + 2x - 8$

x int: $(x-2)(x+4)$; $+2, -4$

Vertex = $(x+1)^2 - 9 \Rightarrow (-1, -9)$



2 x intercepts
AKA 2 roots



$y = \frac{1}{x^2+2x-8}$

② x at $y=1$ and $y=-1$

① asymptote at
$y=0$
$x=2$
$x=-4$

③ $V(-1, \frac{1}{-9})$

④ connect points & curve around the asymptotes

1 x intercept

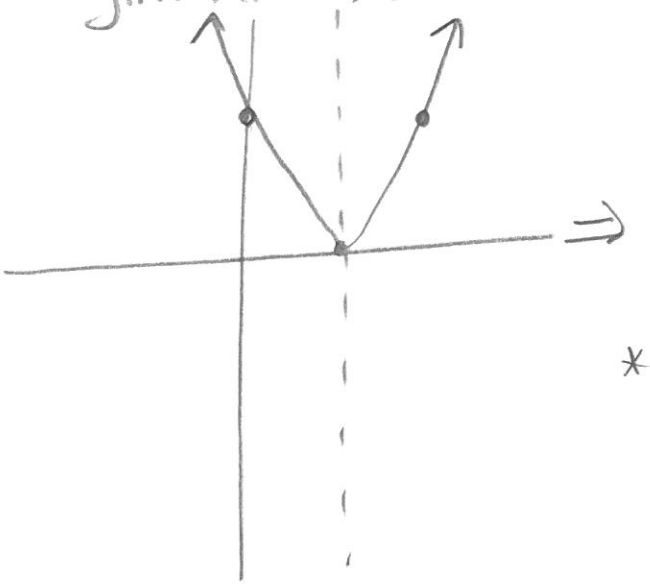
aka 1 root

ex $y=(x-2)^2$

x intercept at 2

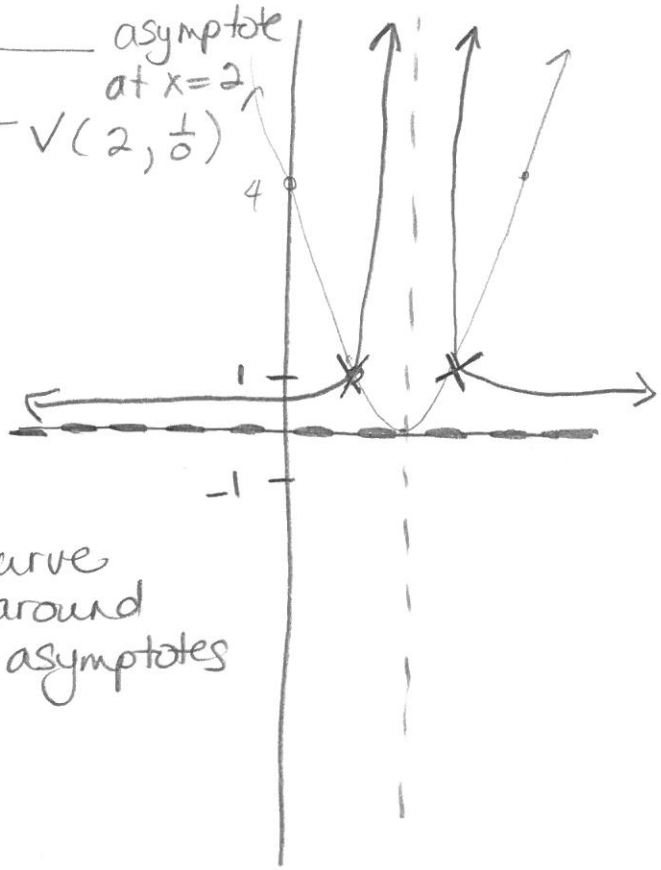
Vertex at (2, 0)

$y_{int} \Rightarrow (x=0) \Rightarrow (0-2)^2 = 4$



asymptote at $x=2$

$V(2, \frac{1}{0})$

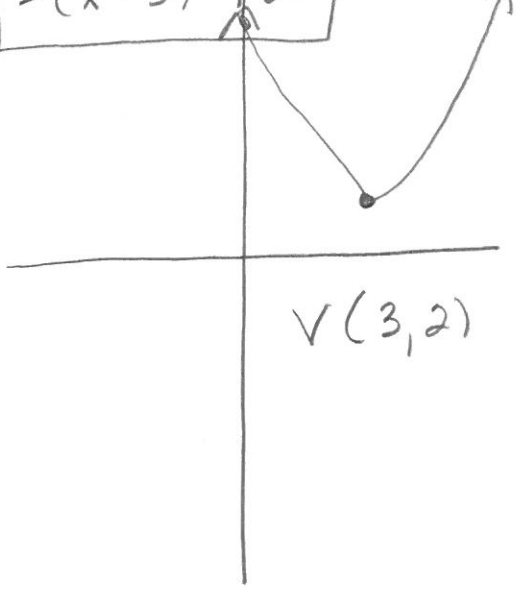


*curve around asymptotes

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

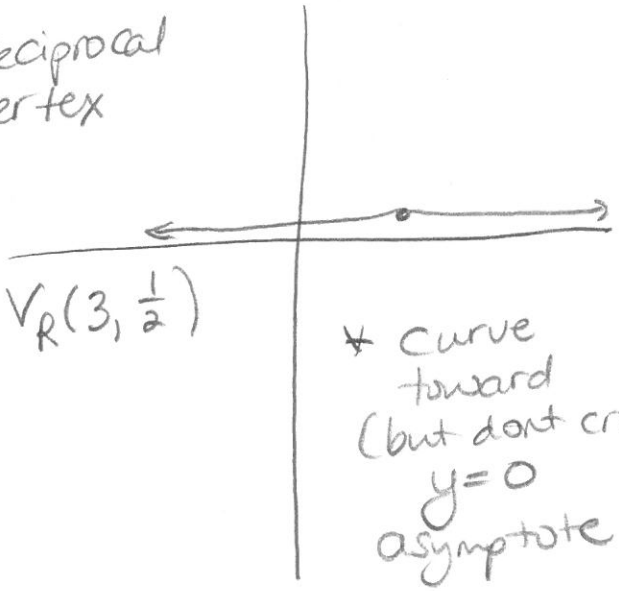
∅ x intercepts

aka NO ROOTS



V(3, 2)

*reciprocal vertex



$V_R(3, \frac{1}{2})$

* curve toward (but dont cross) $y=0$ asymptote