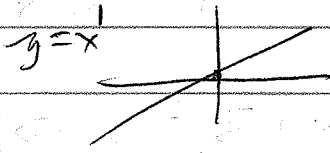
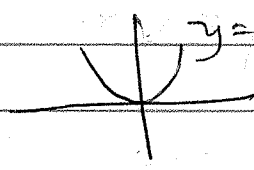


# Sec 4.1, 4.2, 5.1 - Rudiments of Graphing

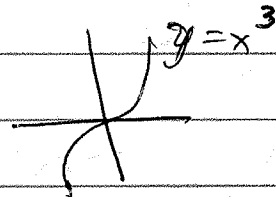
## Master fens



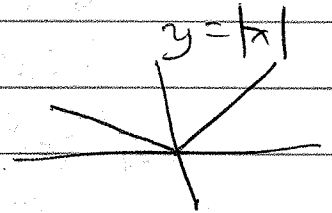
line



parabola

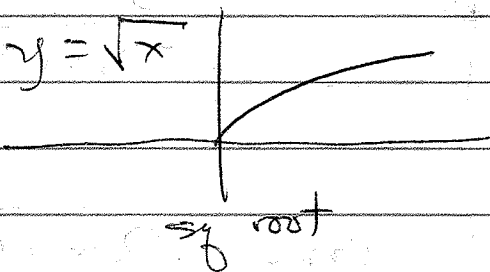


cubic

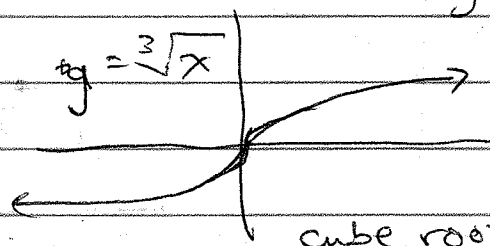


abs val

$$y = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

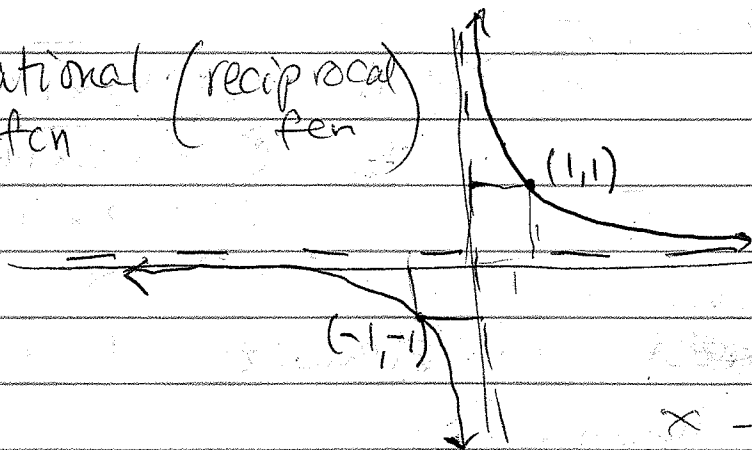


sq root



cube root

rational (reciprocal) fcn



$$y = \frac{1}{x}, \quad x \neq 0$$

Set  $\frac{1}{x} = 0$  to find

to roots?

$$x \cdot \frac{1}{x} = 0 \cdot x \Rightarrow 1 = 0$$

∴

## Transformations of basic fens

- Shift  $\uparrow, \downarrow, \rightarrow, \leftarrow$ , See  $x^2, (x+1)^2, (x-1)^2, \pm \text{const}$
- Reflect over  $x$ -axis,  $y$ -axis, origin
- "Blow up" or shrink down  
Stretch                      Compress

Don't pay attn. to "vertical horizontal Compress"

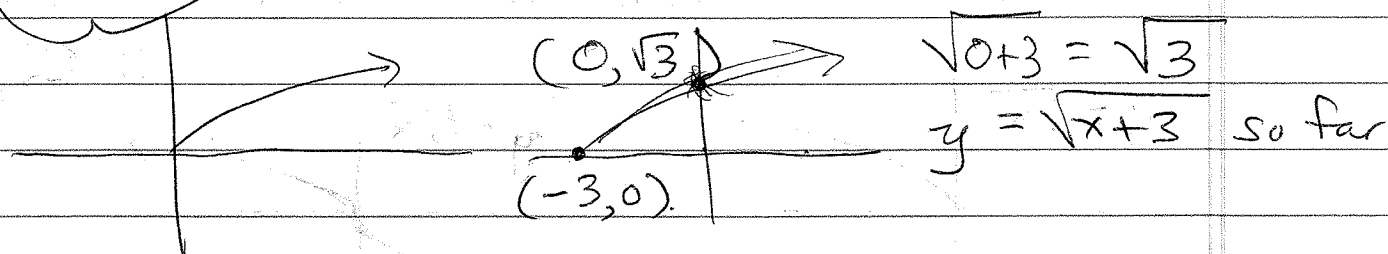
\* Given  $\sqrt{2x+6} = \sqrt{2(x+3)} = \sqrt{2} \sqrt{x+3}$  rewrite

Prelim  $\sqrt{x} \rightarrow \sqrt{2x} \rightarrow \sqrt{2} \sqrt{x} \rightarrow \sqrt{2} \sqrt{x+3}$

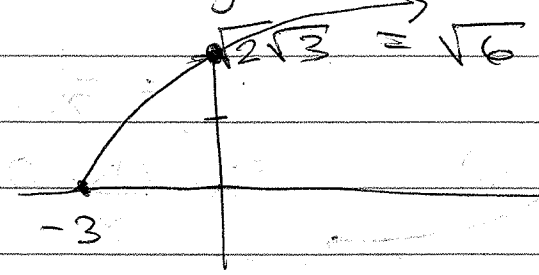
$\sqrt{x}$  goes to  $\sqrt{x+3}$  by moving 3 units left because  $y = \sqrt{x+3} = 0$  when  $x = -3$

$x$ -int  
 $y$ -int

$\sqrt{x+3} = 0 \rightarrow x+3 = 0 \rightarrow x = -3$

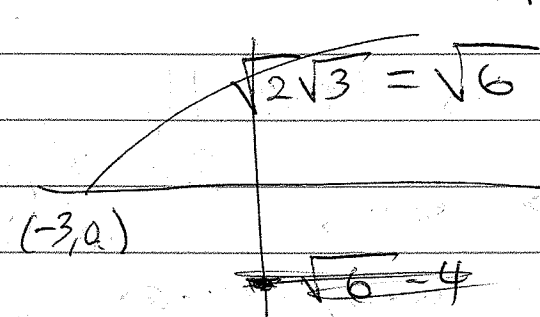


Now  $y = \sqrt{2} \sqrt{x+3}$  from  $\sqrt{2x+6}$

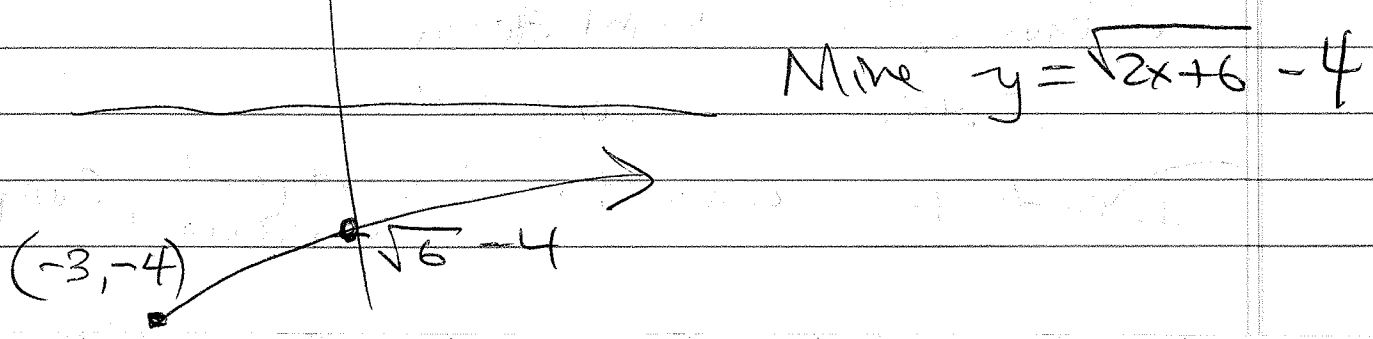


Orig  $y = \sqrt{2x+6}$   
 $0 = \sqrt{2x+6}$   
 $0 = 2x+6$   
 $-3 = x$   
 $y = \sqrt{2(0)+6}$   
 $y = \sqrt{0+6}$   
 $y = \sqrt{6}$

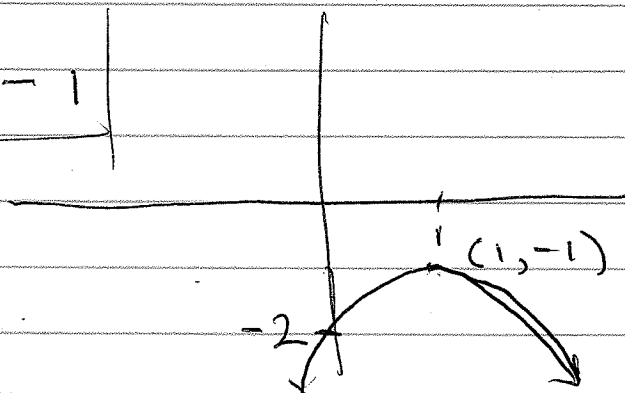
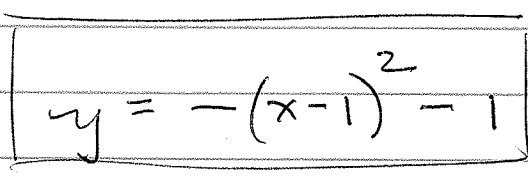
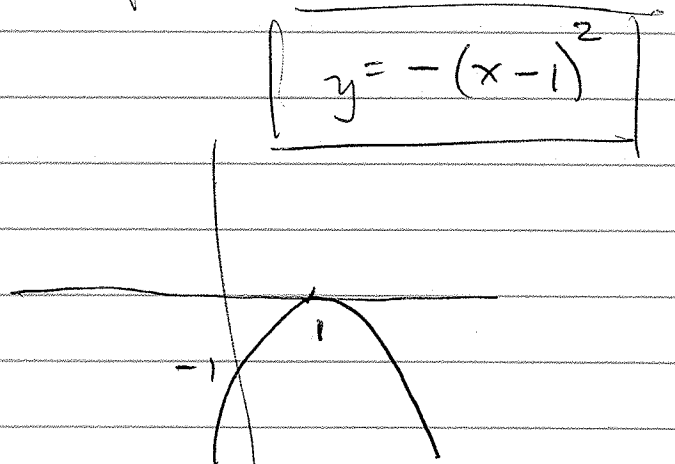
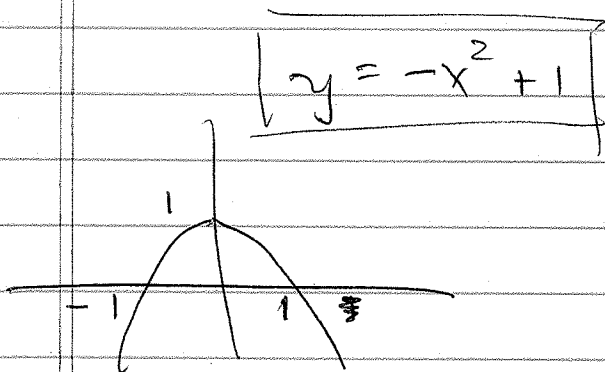
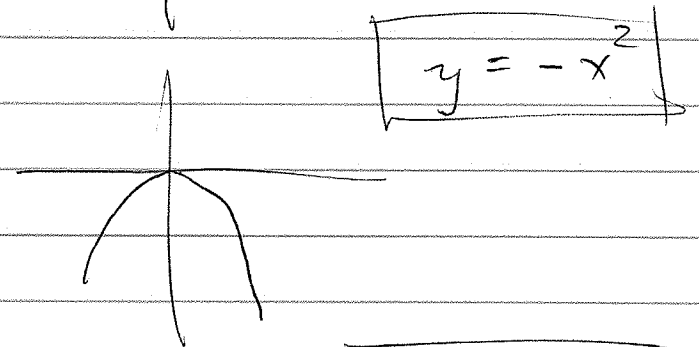
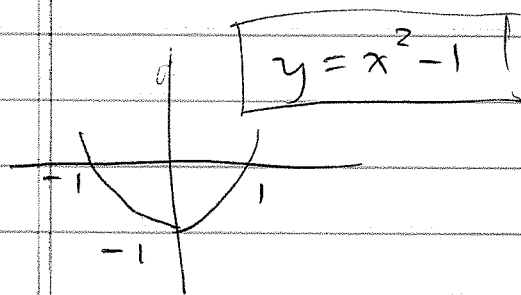
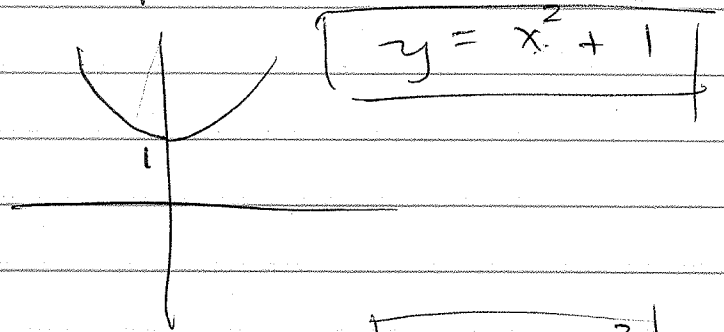
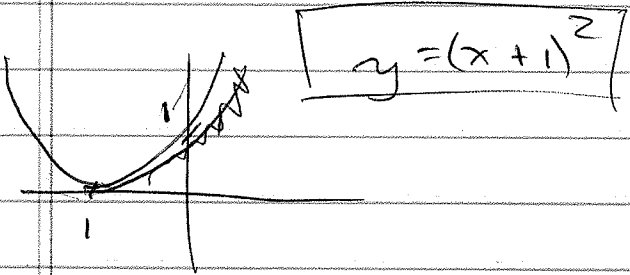
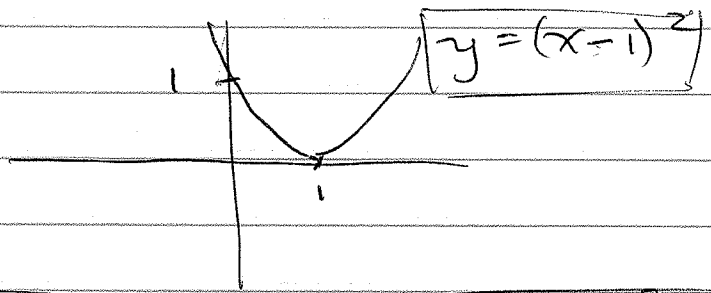
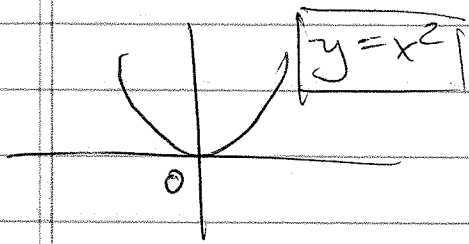
throw in  
If I ~~add~~ the element of subtracting 4, what happens?

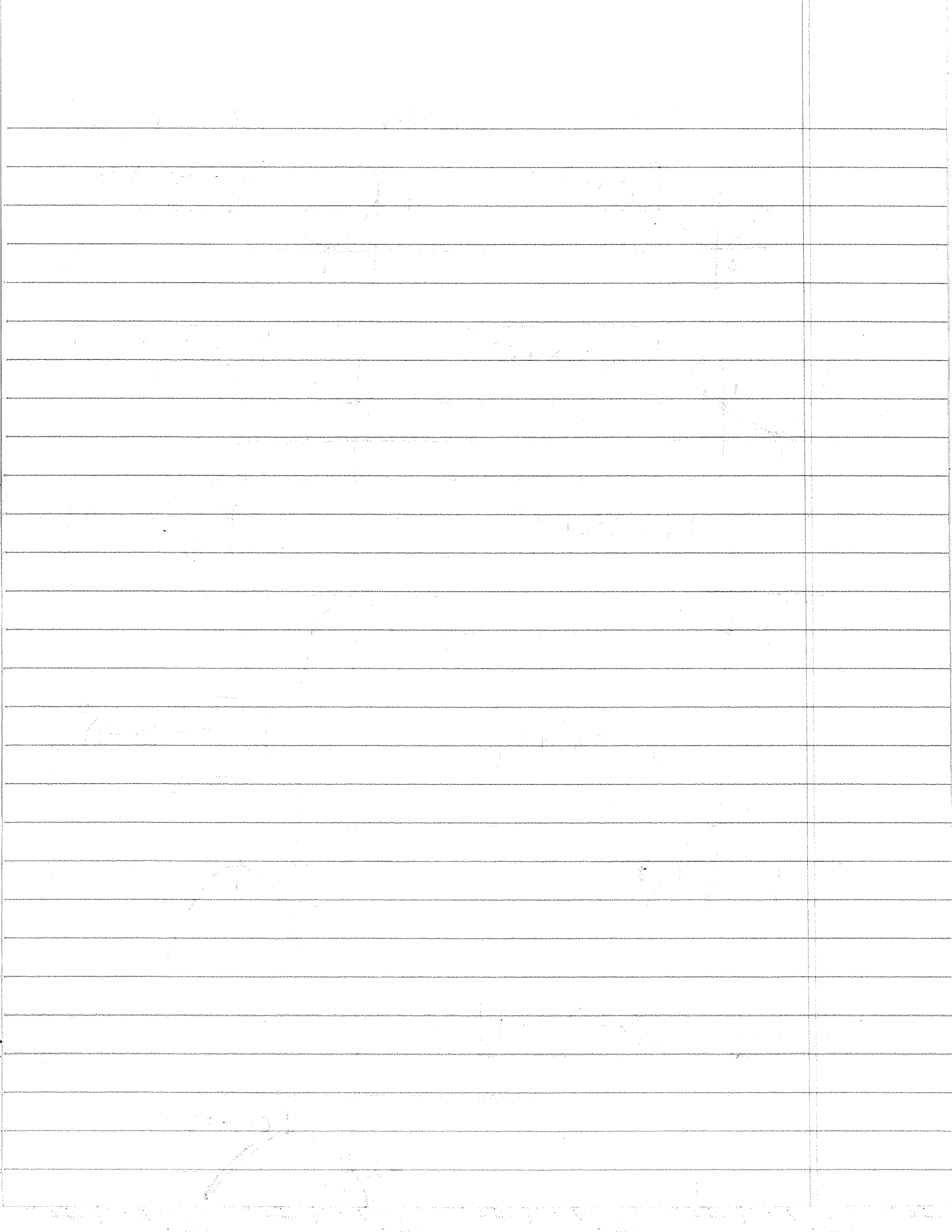


$y = \sqrt{2x+6}$   
 $y - 4 = \sqrt{2x+6} - 4$   
Doing this looks like this



A. look at transformation of  $y = x^2$

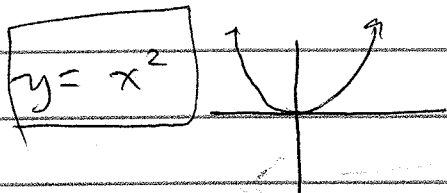




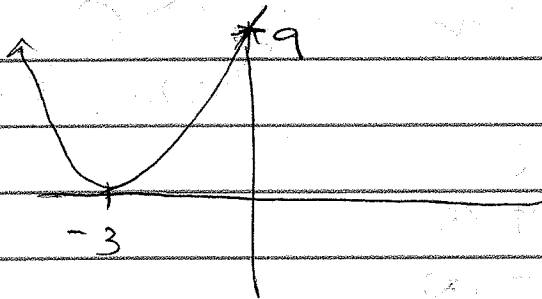
Another example

$$y = (x+3)^2 - 1$$

Identify mother fun:  $y = x^2$



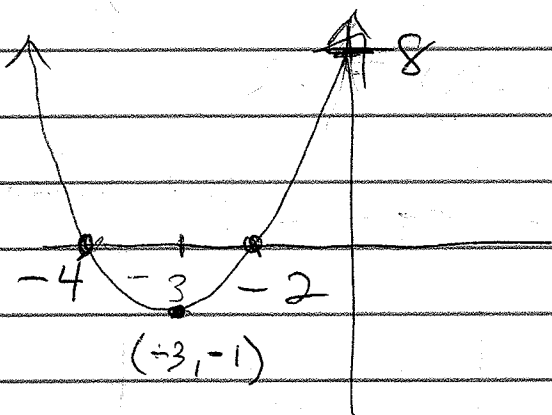
Shift 3 to the left (and check the x-int and y-int)



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

$$y = (0+3)^2 = 9 \quad y\text{-int}$$

Drop 1 unit (down)



$$y = (x+3)^2 - 1$$

$$y = (0+3)^2 - 1 = 8$$

What are the roots?

$$\text{Let } y=0: \quad 0 = (x+3)^2 - 1$$

$$\pm \sqrt{1} = x+3$$

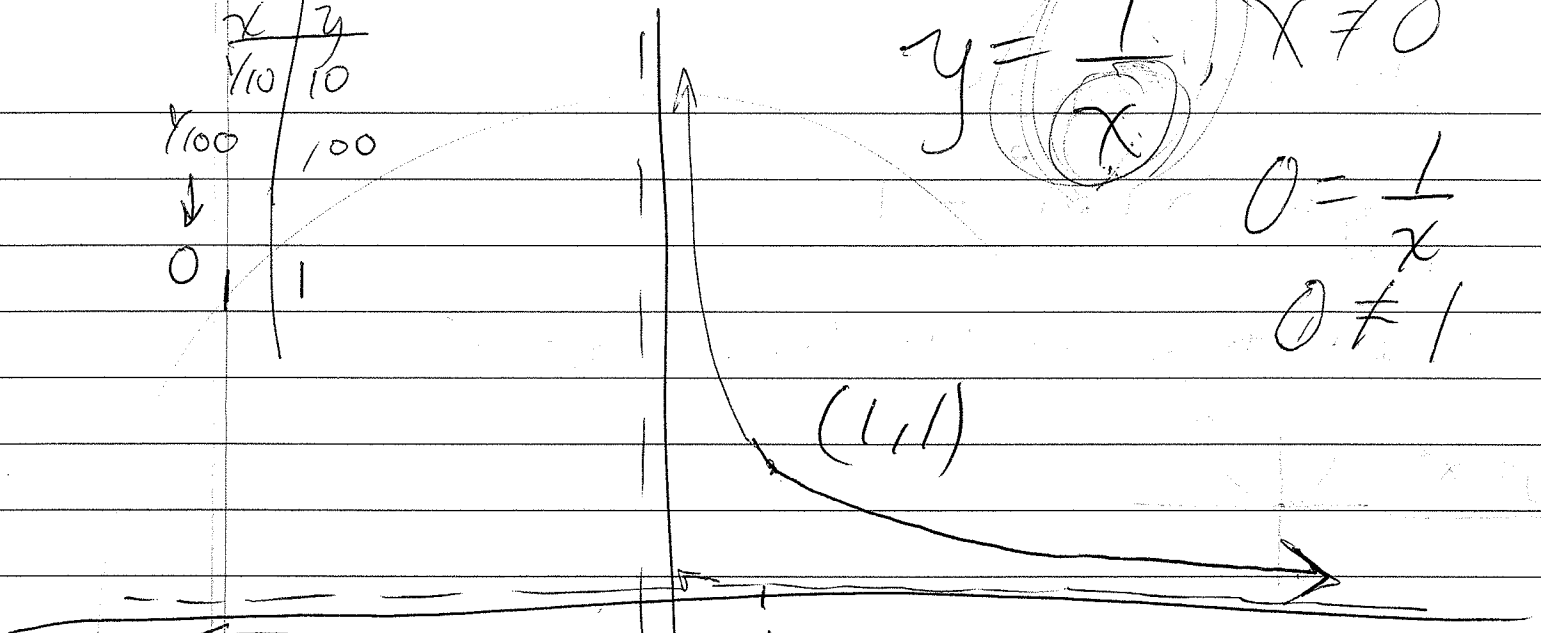
$$-3 \pm 1 = x \quad \rightarrow \quad x = -2, -4$$

x	y
1/10	10
1/100	100
0	1

$$y = \frac{1}{x}, x \neq 0$$

$$0 = \frac{1}{x}$$

$$0 \neq 1$$



As  $x \rightarrow -\infty$   
 $y \rightarrow 0$   
 from negative  
 direction  
 - from below

$(-1, -1)$

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

As  $x \rightarrow \infty$   
 $y \rightarrow 0$   
 from above

As  $x \rightarrow 0$   
 $y \rightarrow +\infty$   
 $-\infty$

~~$f(x) = (x^2 - 2)$ , then  $(x-3)$~~

Given:  $y = -(x-3)^2 - 2$

Mother:  $y = x^2$

Go from here

Shift  
 horizont.

