

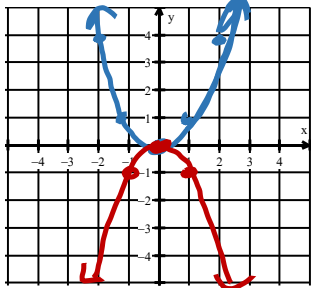
4.3 Reflecting Graphs & Symmetry

HW p.136 #1,3,8,9,11,12,19&20(must show 4 tests),21,27

I) REFLECTIONS

1) Reflection in the x-axis.

$$f(x) = x^2$$

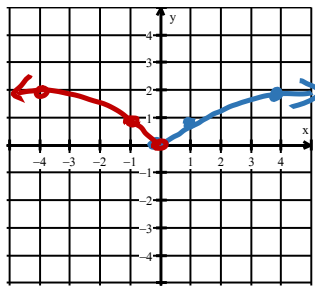


$$y = -x^2$$

$$y = -f(x)$$

2) Reflection in the y-axis.

$$f(x) = \sqrt{x}$$



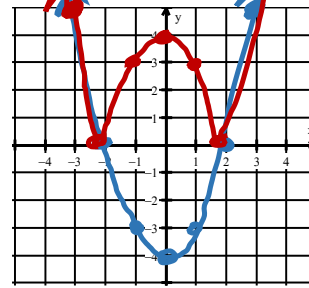
$$y = \sqrt{-x}$$

$$y = f(-x)$$

* opp. x-values

3) Absolute Value

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



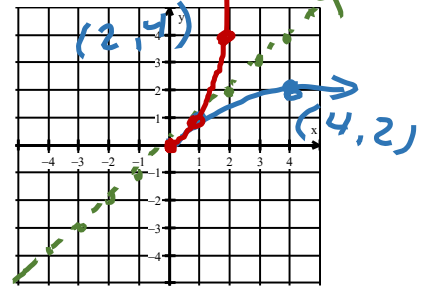
$$y = |x^2 - 4|$$

$$y = |f(x)|$$

* all positive y-values

4) Reflection in the line y=x

$$f(x) = \sqrt{x}$$



$$x = \sqrt{y} \text{ or } y = x^2, x \geq 0$$

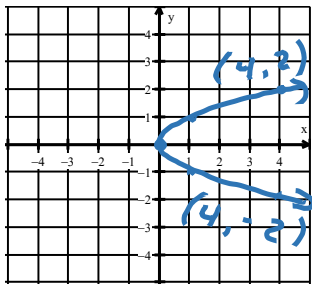
$$x = f(y)$$

* Switch x and y

II) SYMMETRY

1) Symmetry in x-axis.

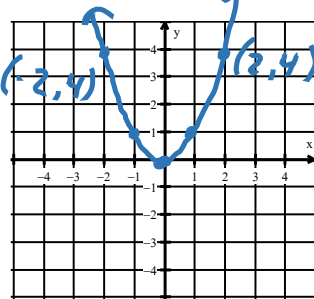
$$y = \pm \sqrt{x} \text{ or } x = y^2$$



$$*(x, -y)$$

2) Symmetry in y-axis.

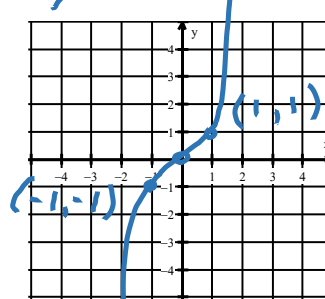
$$y = x^2$$



$$*(-x, y)$$

3) Symmetry in the origin

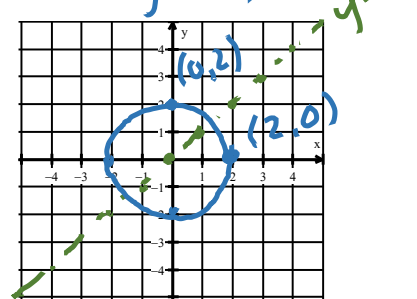
$$y = x^3$$



$$*(-x, -y)$$

4) Symmetry in the line y=x

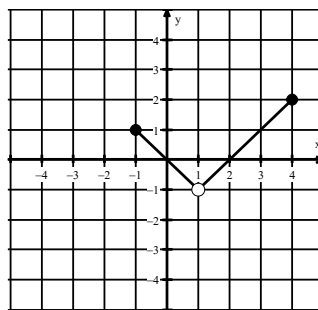
$$x^2 + y^2 = 4$$



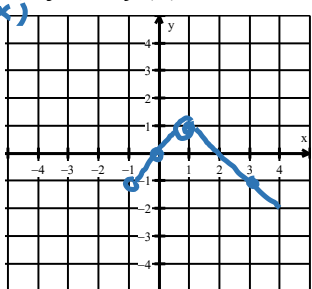
$$*(y, x)$$

1. Given the graph of f(x) sketch

x	f(x)
-1	1
0	0
-1	-1
2	0
3	-1
4	2

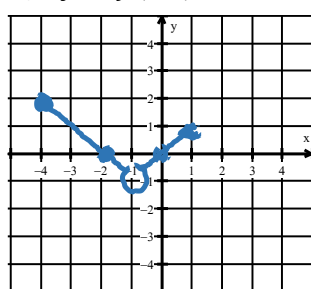


a) $y = -f(x)$



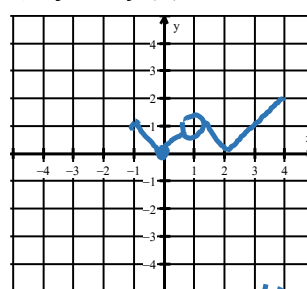
x opp. y-values

b) $y = f(-x)$



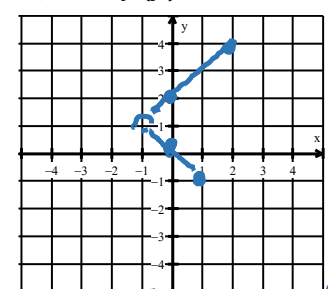
- opp. x-values

c) $y = |f(x)|$



* all positive y-values

d) $x = f(y)$



* Switch x and y

x	-f(x)
-1	-1
0	0
1	1
2	0
3	1
4	-2

4.3 Reflecting Graphs & Symmetry

Rules for Testing Symmetry

- 1) x-axis: substitute $-y$ for y
- 2) y-axis: substitute $-x$ for x
- 3) Line $y=x$: switch x and y .
- 4) Origin (0,0): substitute $-x$ for x and $-y$ for y .

Substitutions must lead to the equivalency of the original equation

2. Test $x^2 + xy = 4$ for symmetry in each part and graph:

a) X-axis $*$ $(x, -y)$

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

$$x^2 - xy = 4$$

Not original eqn.
 \Rightarrow No x-axis symm.

c) Line $y=x$ $*$ (y, x)

$$(y)^2 + (y)(x) = 4$$

Not original eqn.
 \Rightarrow No $y=x$ symm.

b) Y-axis $*$ $(-x, y)$

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

$$x^2 - xy = 4$$

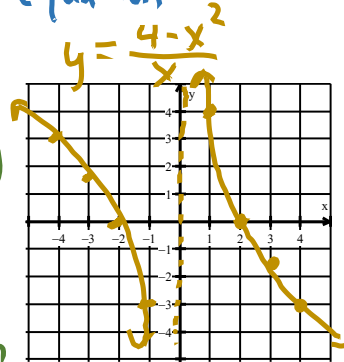
Not original eqn.
 \Rightarrow No y-axis symm.

d) the Origin $*$ $(-x, -y)$

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

$$x^2 + xy = 4$$

Original eqn.
 \Rightarrow origin symmetry!



Q1		Origin	
x	y	-x	-y
0	0	0	0
1	3	-1	-3
2	1	-2	-1
3	5/3	-3	5/3
4	-3	-4	3

3. Test for symmetry and graph: $|x| + |y| = 3$

x-axis: $(x, -y)$

$$|x| + |-y| = 3$$

$$|x| + |y| = 3$$

Yes

y-axis: $(-x, y)$

$$|-x| + |y| = 3$$

$$|x| + |y| = 3$$

Yes

Origin: $(-x, -y)$

$$|-x| + |-y| = 3$$

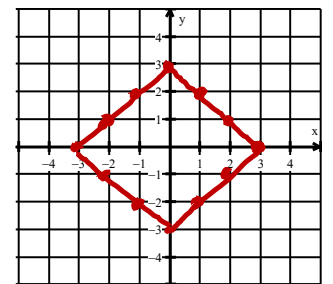
$$|x| + |y| = 3$$

Yes

$y=x$: (y, x)

$$|y| + |x| = 3$$

Yes



Q1		D: [-3, 3]	
x	y	R: [-3, 3]	
0	3	Z: -3, 3	
1	2		
2	1		
3	0		

4.3 Reflecting Graphs & Symmetry

Warm-Up

1. Find the Domain, Range, and Zeros of $f(x) = -\sqrt{x-3}$
2. If $f(x) = 3x - x^2$ and $g(x) = x + 1$, find $(f-g)(x)$