1. $x^2+y^2-6x-4y-5=0$

$x^2-6x+9+y^2-4y+4 = 5+9+4$

$(x-3)^2+(y-2)^2=18$

center $=(3,2)$

radius $=\sqrt{18}=\sqrt{9\cdot 2}=3\sqrt{2}$

2. $(f-g)(x)=x-3-(x^2+1)=x-3-x^2-1=-x^2+x-4$

3. $f(g(x))=f\left(\frac{x+1}{4}\right)=4\cdot\frac{x+1}{4}-1=x+1-1=x$

$(fog)(x)$

$f(x)=4x-1$

$g(f(x))=g(4x-1)=\frac{4x-1+1}{4}=x$

inverse functions

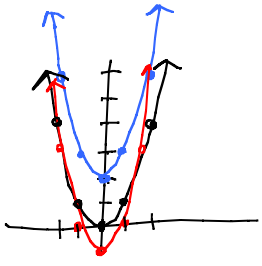
$x \xrightarrow{\text{mult by 4}} 4x \xrightarrow{\text{subtract 1}} 4x-1$

$x \xrightarrow{\text{add 1}} x+1 \xrightarrow{\text{divide by 4}} \frac{x+1}{4}$

Section 2.3: Transformations

$f(x)=x^2$

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



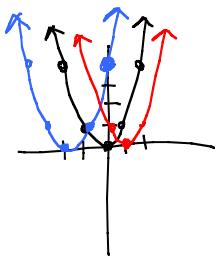
$f(x)=x^2+2$

x	f(x)
0	2
1	3
-1	3
2	6
-2	6

$f(x)=x^2-1$

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

$f(x)=x^2$



replace x with x+2

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

x	f(x)
0	4
1	9
-1	1
-2	0
-3	1

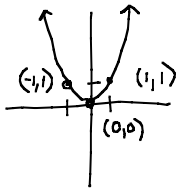
replace x with x-1

$f(x)=(x-1)^2$

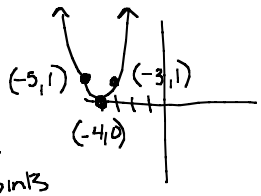
Combining Horizontal and Vertical Shifts

Graph $f(x) = (x+4)^2 - 3$

$f(x) = x^2$

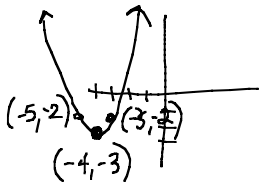


$f(x) = (x+4)^2$



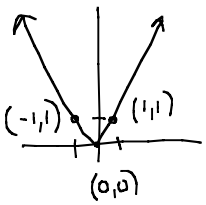
key points

$f(x) = (x+4)^2 - 3$



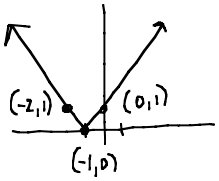
Graph: $f(x) = |x+1| + 4$ using transformations.

$f(x) = |x|$



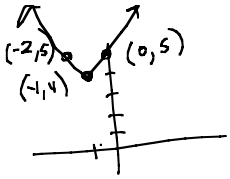
hor. shift.

$f(x) = |x+1|$



vert. shift

$f(x) = |x+1| + 4$



Vertical Stretches + Compressions

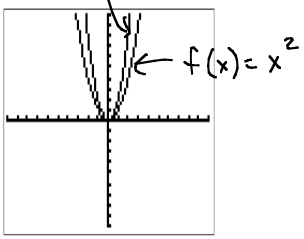
$f(x) = x^2$

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

$f(x) = 2x^2$

x	f(x)
0	0
1	2
-1	2
2	8
-2	8

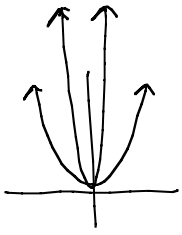
$f(x) = 2x^2$



$f(x) = x^2$

$f(3x) = (3x)^2 = 9x^2$

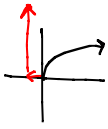
↑ replace x with 3x



$f(x) = x^2$ $\quad f(-x) = (-x)^2$

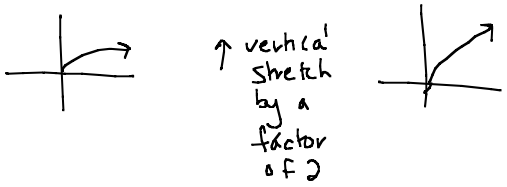
$g(x) = (x-3)^2 + 1$ ∪ → right 3 ↑ up 1

12. $G(x) = \sqrt{x+1} + 5$

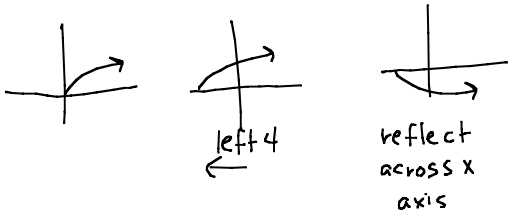


← left 1 ↑ up 5

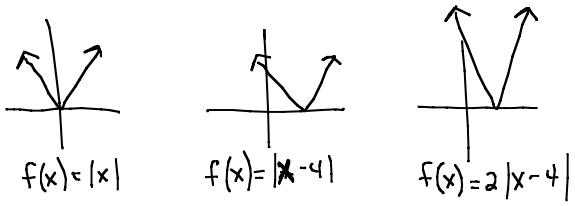
16. $g(x) = 2\sqrt{x}$

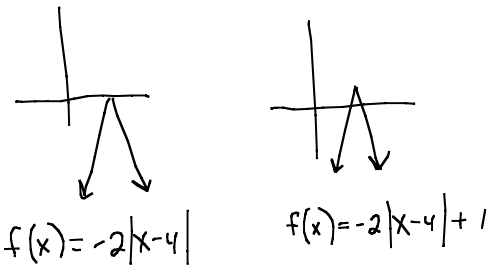


20. $F(x) = -\sqrt{x+4}$



22. $h(x) = -2|x-4|+1$





Homework: Section 2.3 1-45 (odd)