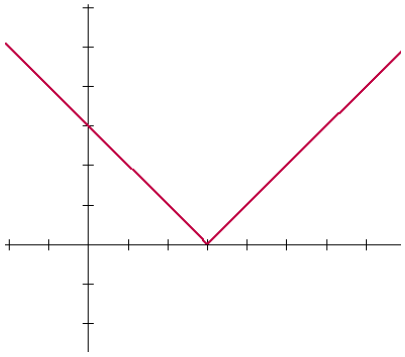
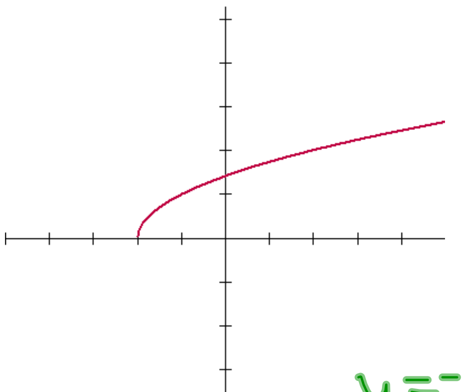
4. Absolute Value



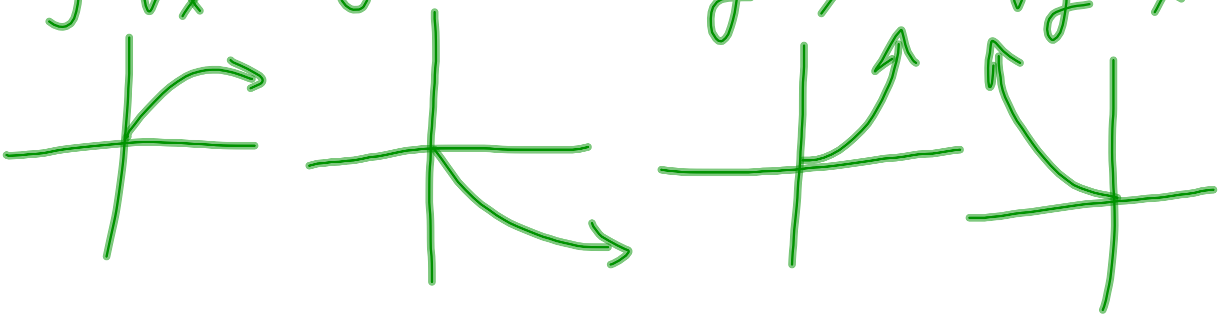
- V-Shaped
- Equation will have a variable within the absolute value bars
- Should be able to apply transformations to the basic absolute value functions

5. Square Root



- Half parabola
- Equation will have a variable under the square root sign
- Should be able to apply transformations to the basic square root function

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



Warm-Up...

Given the function $f(x) = \begin{cases} 2 - x^2 & if \;\; x < 1 \\ 3 & if \;\; x = 1 \\ 2x - 1 & if \;\; 1 < x \le 3 \\ (x-4)^2 & if \;\; x > 3 \end{cases}$

Evaluate the following: f(-1) f(1) f(3) f(2)

- Draw a sketch of this function

$f(-1) = 2-(-1)^2 = 1$ $\quad F(1) = 3$ $\quad F(3) = 2(3) - 1 = 5$ $\quad f(2) = 2(2) - 1 = 3$

Sketch:

$y = -x^2 + 2$

$V(0, 2)$

x	y
1	1

$(1, 3)$

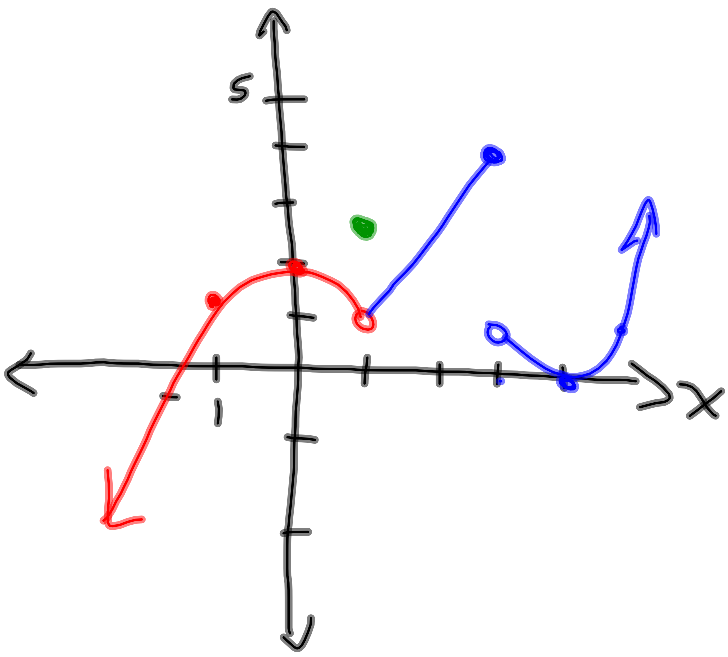
$y = 2x - 1$

x	y
1	1
3	5

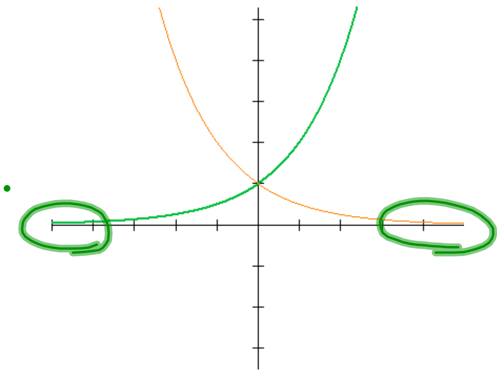
$y = (x-4)^2$

$V(4, 0)$

x	y
3	1



6. Exponential

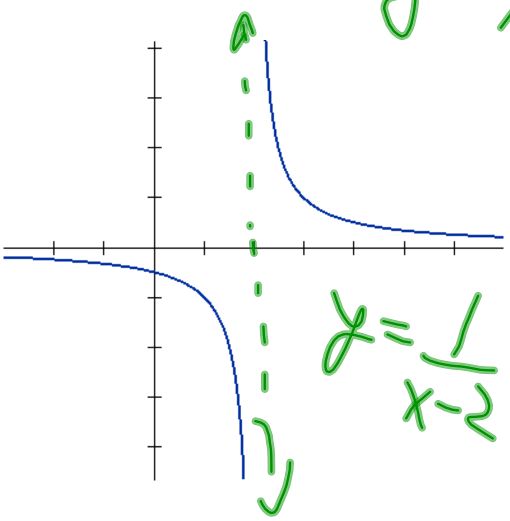


- Steadily increasing or decreasing
- Base will be a number and variable will appear in the exponent
- Should be able to identify the horizontal asymptote

$y = 2^x$

7. Reciprocal

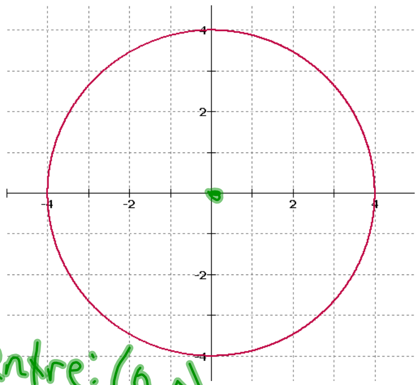
$y = \frac{1}{x}$



- Will have two branches
- Equation will have a variable within denominator of a rational expression
- Be able to identify the vertical and horizontal asymptotes

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

8. Circle



- General form: $(x-h)^2+(y-k)^2=r^2$

  * center: (h, k)
  * radius $= r$

- Be able to identify the function that would describe either just the top or bottom of the circle.

Centre: (0,0)
r = 4

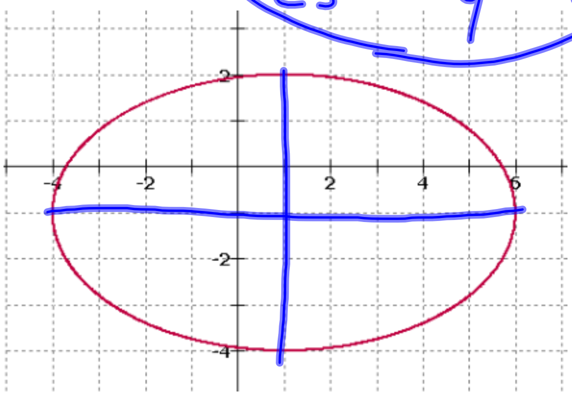
$x^2+y^2=16$

Centre: (−2,5)
r = 6

$\boxed{(x+2)^2+(y-5)^2=36}$

9. Ellipse

$$\frac{(x-1)^2}{25}+\frac{(y+1)^2}{9}=1$$



- General form: $\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$

Where…

- Center: (h, k)
- a > b
- If a is the denominator of the "y" term the ellipse will have a vertical major axis.

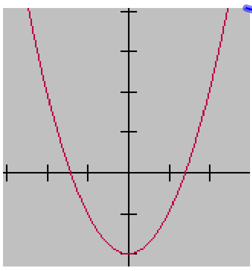
Symmetry

Even

$$f(-x) = f(x)$$

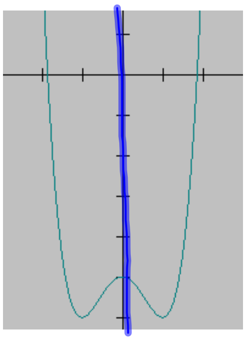
Even functions are symmetric about the y-axis

$y = x^2 - 2$



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

$y = x^4 - 2x^2 - 5$

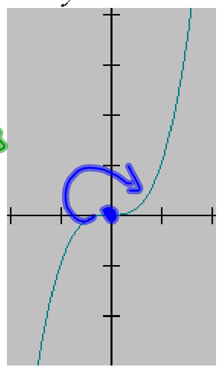


Odd

$$f(-x) = -f(x)$$

Odd functions are symmetric about the origin

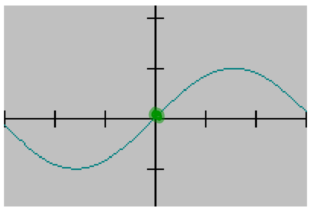
$y = x^3$



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

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

$y = \sin(x)$



$y = x^4 - 3x^2 + 7 \rightarrow$ even

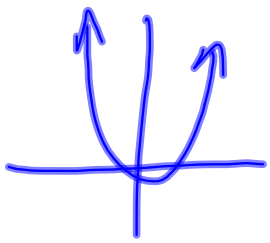
$y = x^3 - 5x^9 \rightarrow$ odd

$y = x^3 - x^7 + 3 \rightarrow$ Neither

$y = x^2 - 5x \rightarrow$ Neither

New Functions from Old Functions...TRANSFORMATIONS

- Translations
- Stretches
- Reflections



Translation

- To *translate* or *shift* a graph is to move it up, down, left, or right without changing its shape.
- Translation is summarized by the following table and illustration:

Vertical and Horizontal Shifts Suppose $c > 0$. To obtain the graph of

$y = f(x) + c$, shift the graph of $y = f(x)$ a distance c units upward

$y = f(x) - c$, shift the graph of $y = f(x)$ a distance c units downward

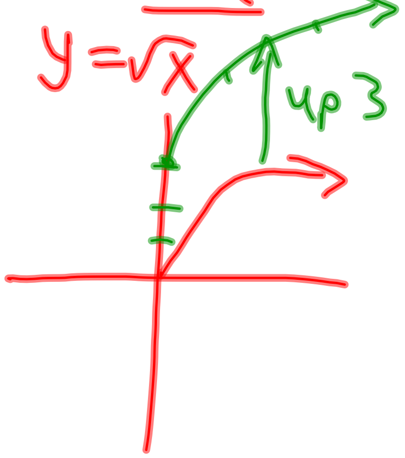
$y = f(x - c)$, shift the graph of $y = f(x)$ a distance c units to the right

$y = f(x + c)$, shift the graph of $y = f(x)$ a distance c units to the left

$y = \sqrt{x} \underline{+3}$

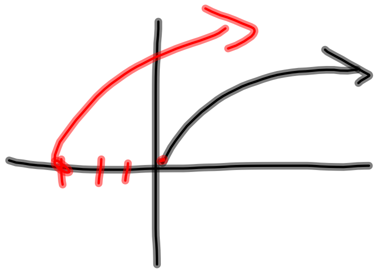
Base

$y = \sqrt{x}$



$y = \sqrt{x+3}$

"shift Left 3"



Translations illustrated...

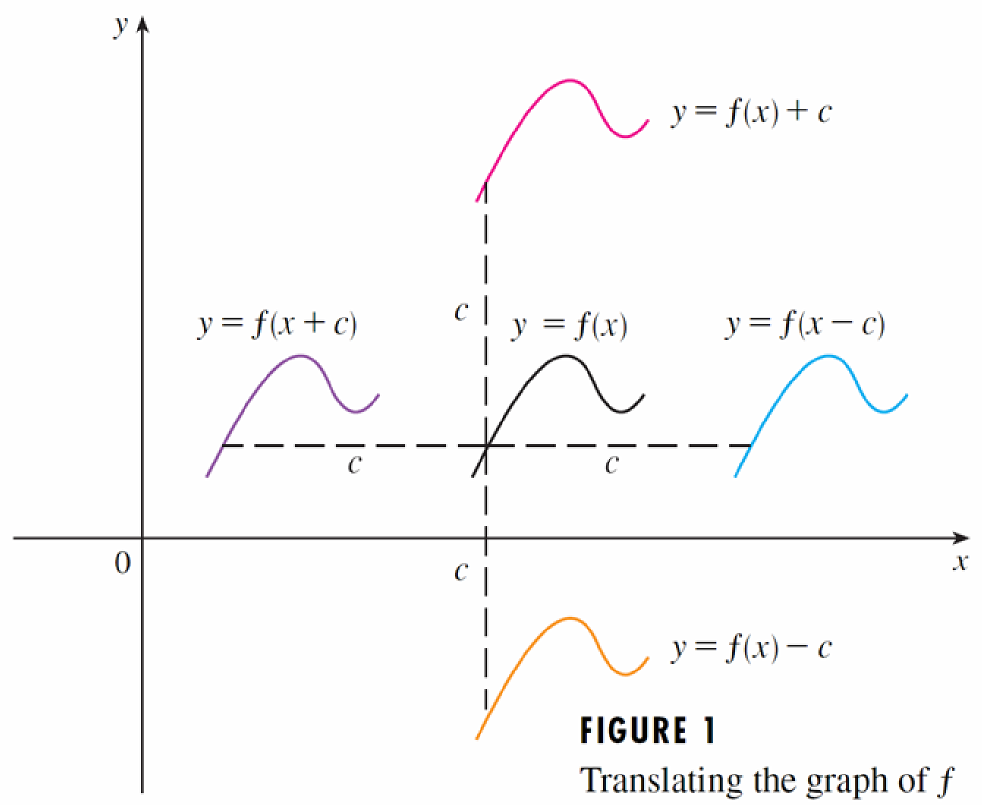


FIGURE 1
Translating the graph of f

Identify the translations for each of the following...

$f(x) = (x+7)^2$

"Left 7"

$y = x^2$

$f(x) = |x| + 3$

" 3 units up "

$y = |x|$

$f(x) = \sqrt{x-3} - 2$

Right 3
Down 2

$y = \sqrt{x}$

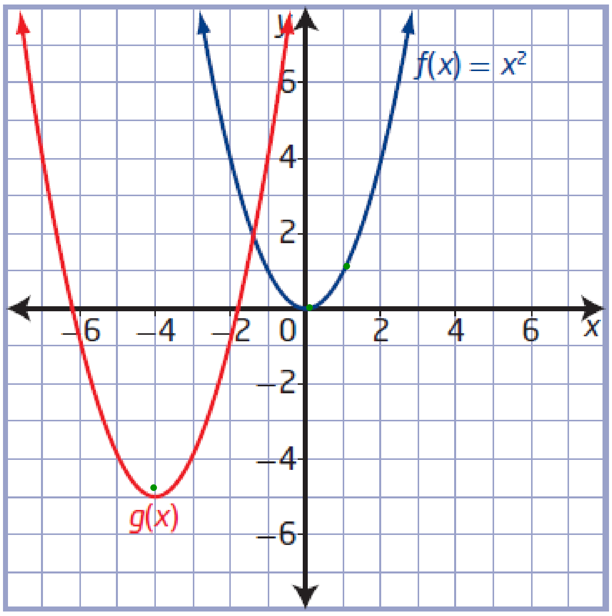
$y = \frac{1}{x}$

$f(x) = \frac{1}{x-5} + 7$

Right 5
Up 7

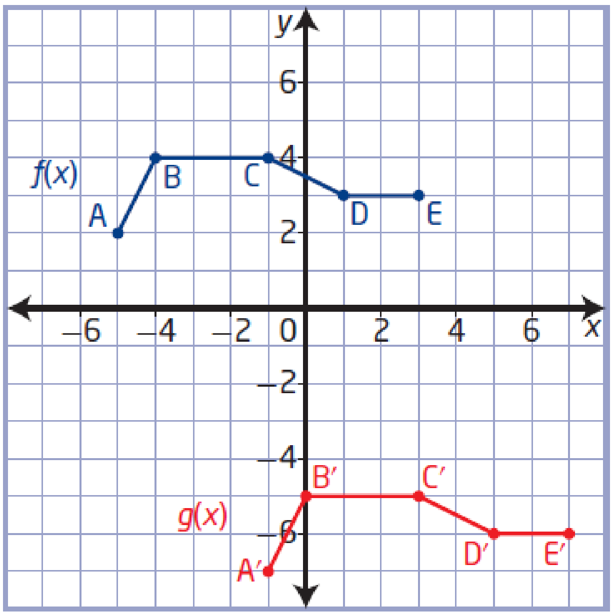
Determine the Equation of a Translated Function

a)



$f(x) = (x+4)^2 - 5$

b)



Pg. 12 & 13

#1, 2, 3, 4, 5, 6, 7

Attachments

applications of sequences.doc