

Transformations
Graphing by Hand
and
Function Notation

Part I
Review Graphing
Parent Functions
from Cycle 1
and
Review
Transformations
from Day 11

Try On Your Own

Print the Worksheet for grids

Or find a sheet of graph paper

Or just used lined paper and do your best.

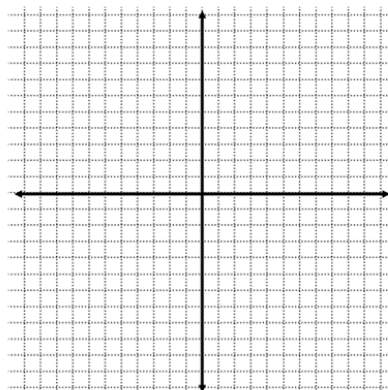
State transformations and

Accurately graph the Parent Function
and **each** transformation on grid

$$y = 3x^2 + 5$$

Step by Step

Instruction on
the next pages



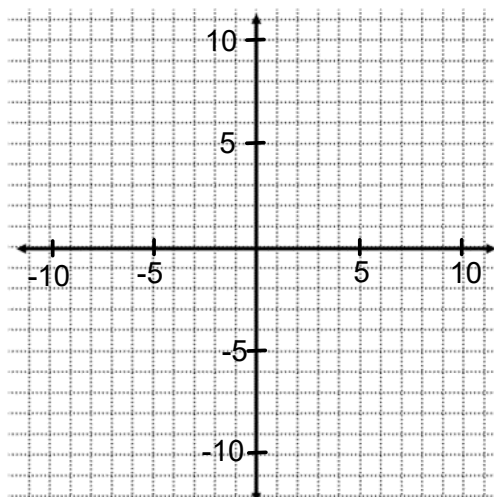
Label the axis on the graph.

You will be graphing **accurately**.

State transformations and

accurately graph on grid provided

$$y = 3x^2 + 5$$

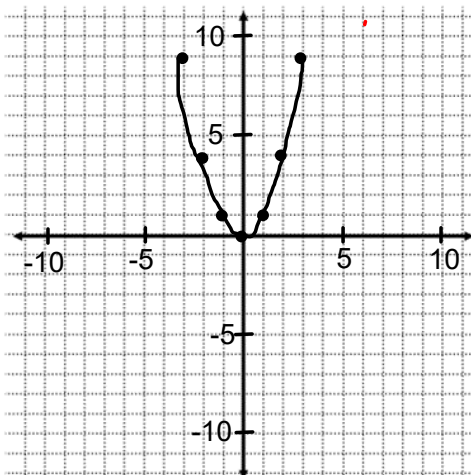


Draw the Parent Function

Look back in your notes for help, you hopefully remember the parabola but you may need help on the other parent functions.

State transformations and accurately graph on grid provided

$$y = 3x^2 + 5$$



Graph each transformation step by step.

Do Vertical Stretch first, move each point.

State transformations and accurately graph on grid provided

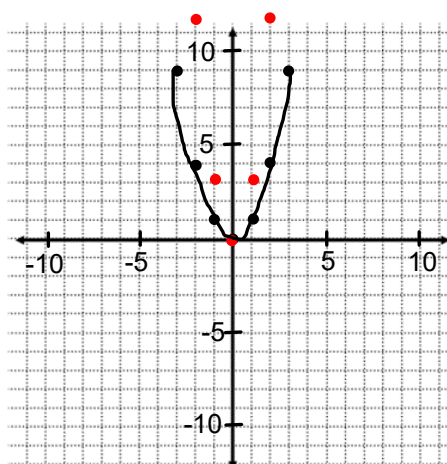
$$y = 3x^2 + 5$$

V. Stretch x3

(0,0) stays at (0,0)

(1,1) moves to (1,3)

(2,4) moves to (2,12)



Graph Vertical Stretch

I tried my best to 'connect the points'

State transformations and accurately graph on grid provided

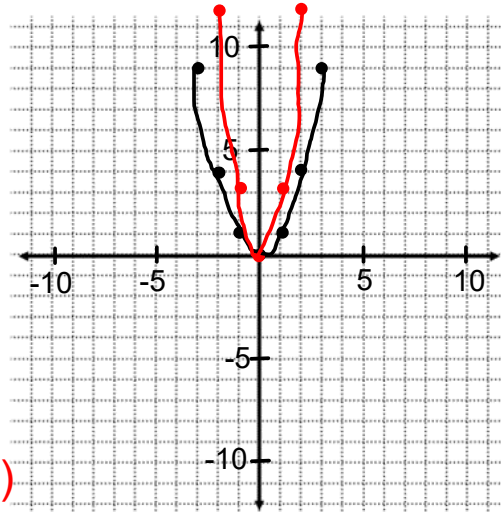
$$y = 3x^2 + 5$$

V. Stretch x3

(0,0) stays at (0,0)

(1,1) moves to (1,3)

(2,4) moves to (2,12)



Graph the next transformation.

State transformations and accurately graph on grid provided

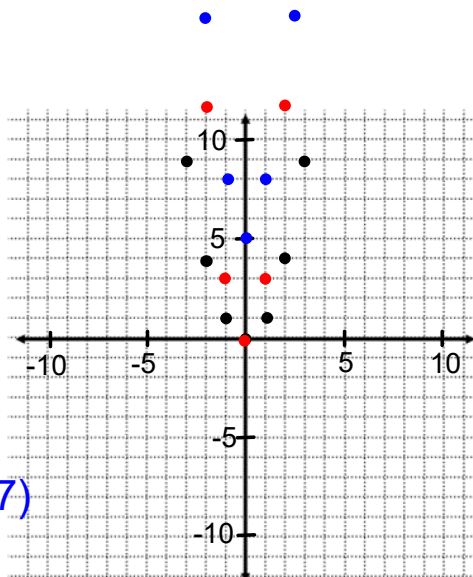
$$y = 3x^2 + 5$$

V. Translation Up 5

(0,0) moves to (0,5)

(1,3) moves to (1,8)

(2,12) moves to (2,17)



Graph Vertical Translation.

I tried my best to 'connect the points' - its very difficult on the computer.

State transformations and accurately graph on grid provided

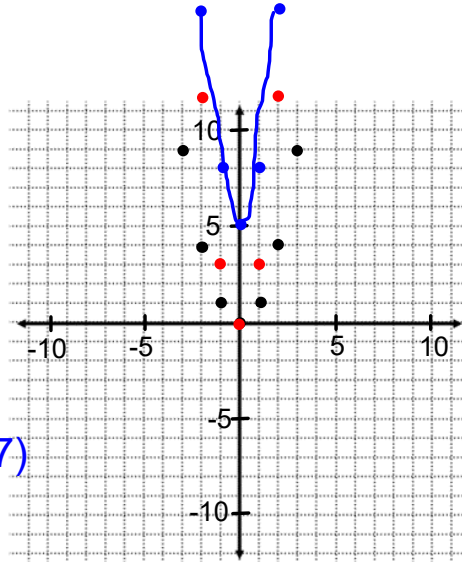
$$y = 3x^2 + 5$$

V. Translation Up 5

(0,0) moves to (0,5)

(1,3) moves to (1,8)

(2,12) moves to (1,17)

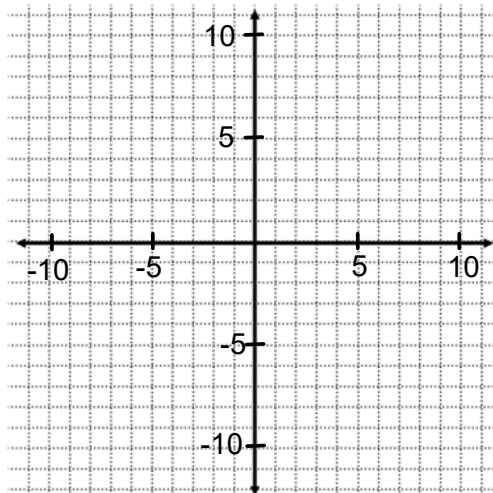


Label the Axis and Draw the Parent Function

Look back in your notes for help, or find a BIG hint on the next page

State transformations and accurately graph step by step.

$$y = 0.5\sqrt{x} - 4$$

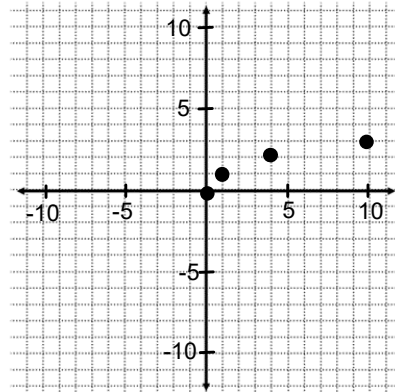


Parent Function - Square Root

State transformations and accurately graph step by step.

$$y = 0.5\sqrt{x} - 4$$

x	$y = \sqrt{x}$
0	0
1	1
4	2
9	3



Now that you have the Parent Function ...

Graph the Transformations

Check your answer on Nspire

- look at the Table of Values to check your points.

Label the Axis and Draw the Parent Function

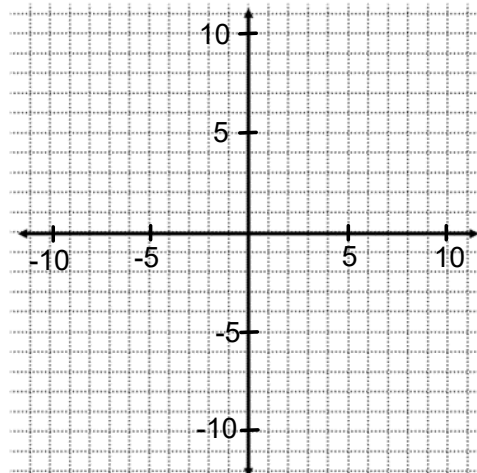
Look back in your notes for help, or find a BIG hint on the next page

State transformations and graph step by step.

Check your answer on Nspire

- look at the Table of Values to check your points.

$$y = \frac{2}{x} + 3$$



Step by Step

Instruction on

the next pages

Parent Function - Reciprocal

State transformations and graph step by step.

Check your answer on Nspire

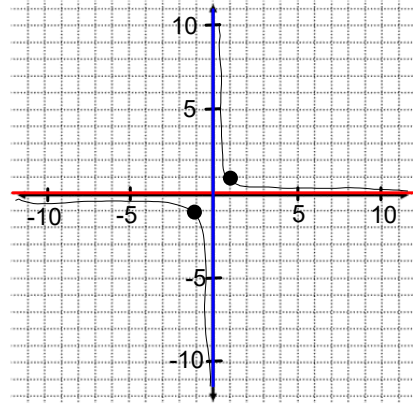
- look at the Table of Values to check your points.

$$y = \frac{2}{x} + 3$$

Review of how to draw the Reciprocal Function

$$f(x) = \frac{1}{x}$$

x	y
-3	-.33
-2	-.5
-1	-1
0	∞ or ∞ or ∞
1	1
2	.5
3	.33



so x can't be 0 there is an asymptote

and y will never be 0 there is an asymptote

Plot (1,1) and (-1,-1) accurately,

then carefully draw 2 curves close to asymptotes.

State transformations and graph step by step.

Check your answer on Nspire

- look at the Table of Values to check your points.

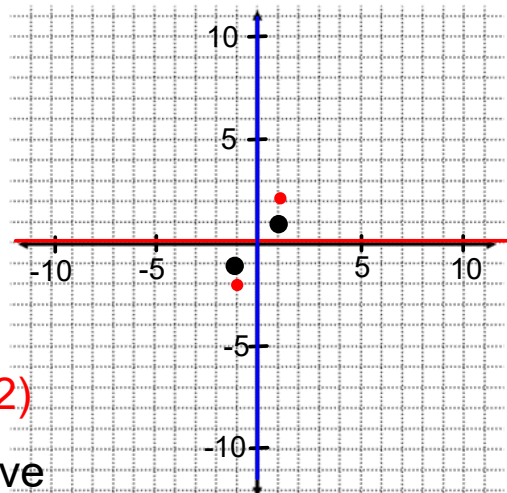
$$y = \frac{2}{x} + 3$$

V. Stretch (x2)

(1,1) moves to (1,2)

(-1,-1) moves to (-1,-2)

Asymptotes don't move with a Vertical Stretch



State transformations and graph step by step.

Check your answer on Nspire

- look at the Table of Values to check your points.

$$y = \frac{2}{x} + 3$$

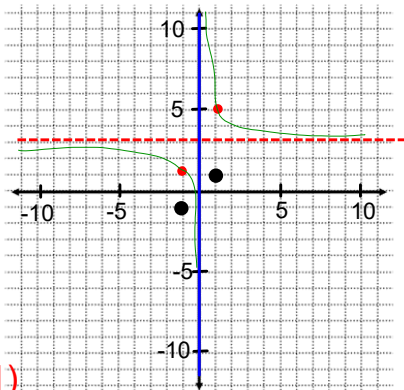
V. Translation Up 3

(1,2) moves to (1,5)

(-1,-2) moves to (-1,1)

Red Asymptote moves to $y=3$ (Up 3)

Blue Asymptote stays put



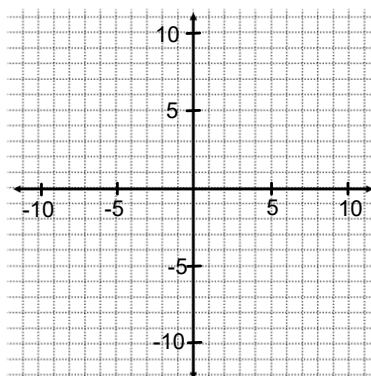
Try on Your Own

Give this one a good try, you will need to look back in your notes for the Parent Functions, no solutions provided.

If you're having difficulty come back after watching the video.

State transformations and
accurately graph on grid provided

$$y = 2^x + 3$$



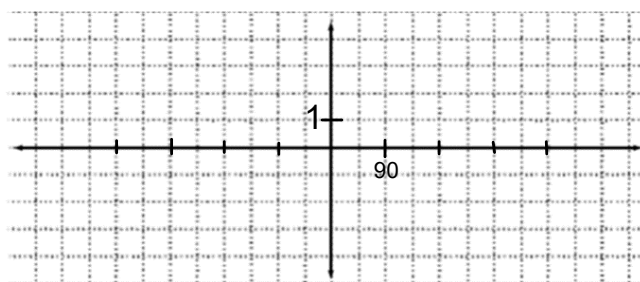
Try on Your Own

Give this one a good try, you will need to look back in your notes for the Parent Functions, no solutions provided.

If you're having difficulty come back after watching the video.

State transformations and
accurately graph on grid provided

$$y = 3\sin x - 2$$



Part 2

Transformations

and

Function Notation

Try On Your Own

Graph on Nspire (Also works on Desmos)

State the Parent Function

State the Transformations

$$f_1(x) = x^2$$

$$f_2(x) = 2f_1(x)$$

$$f_3(x) = f_1(x) + 5$$

Try On Your Own

Graph on Nspire

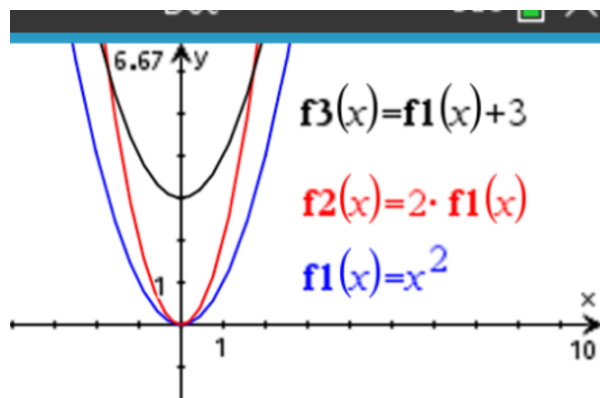
State the Parent Function

State the Transformations

$$f_1(x) = x^2 \quad \text{Quadratic}$$

$$f_2(x) = 2 \cdot f_1(x) \quad \text{Vertical Stretch (x2)}$$

$$f_3(x) = f_1(x) + 3 \quad \text{Vertical Translation (Up 3)}$$



Try On Your Own

Change $f_1(x) = \sqrt{x}$

State the Parent Function

State the Transformations

What happened to $f_2(x)$ and $f_3(x)$?

$$f_2(x) = 2f_1(x)$$

$$f_3(x) = f_1(x) + 3$$

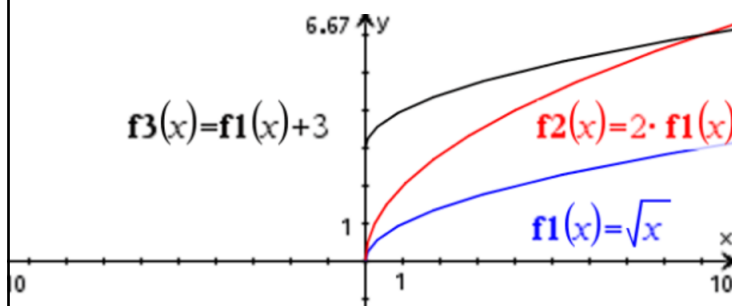
Try On Your Own

Change $f_1(x) = \sqrt{x}$

State the Parent Function

State the Transformations

What happened to $f_2(x)$ and $f_3(x)$?



same transformations but on
a different Parent Function -
Square Root Function

Try On Your Own

Change

State the Parent Function

State the Transformations

$$f_1(x) = \frac{1}{x}$$

What happened to $f_2(x)$ and $f_3(x)$?

$$f_2(x) = 2f_1(x)$$

$$f_3(x) = f_1(x) + 3$$

What happened to the Asymptotes?

Try On Your Own

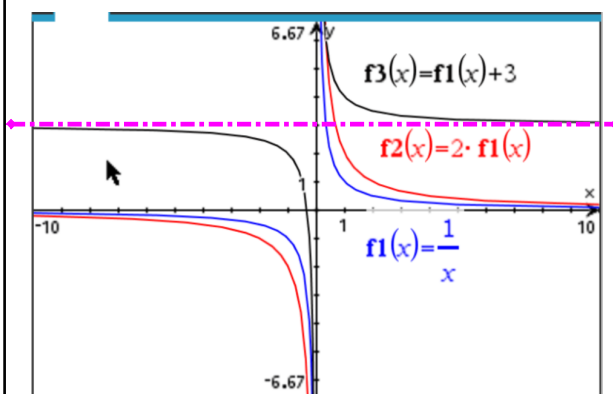
Change

$$f_1(x) = \frac{1}{x}$$

State the Parent Function

State the Transformations

What happened to $f_2(x)$ and $f_3(x)$?



same transformations applied to
Reciprocal Function

Horizontal Asymptote moves up 3



Try On Your Own

Change

State the Parent Function

State the Transformations

$$f_1(x) = 2^{-x}$$

What happened to $f_2(x)$ and $f_3(x)$?

$$f_2(x) = 2f_1(x)$$

$$f_3(x) = f_1(x) + 3$$

What happened to the Asymptote?

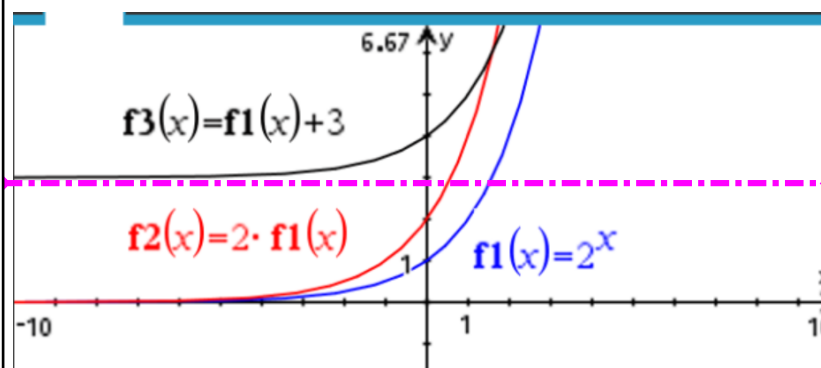
Try On Your Own

Change

$$f_1(x) = 2^{-x}$$

State the Parent Function

State the Transformations



same transformations applied to the Exponential Function

Asymptote moves up 3, $y = 3$

Try On Your Own

Change

$$f_1(x) = \sin(x)$$

Change window setting to "Zoom Trig"

State the Parent Function

State the Transformations

What happened to $f_2(x)$ and $f_3(x)$?

What happened to the Axis of Symmetry?

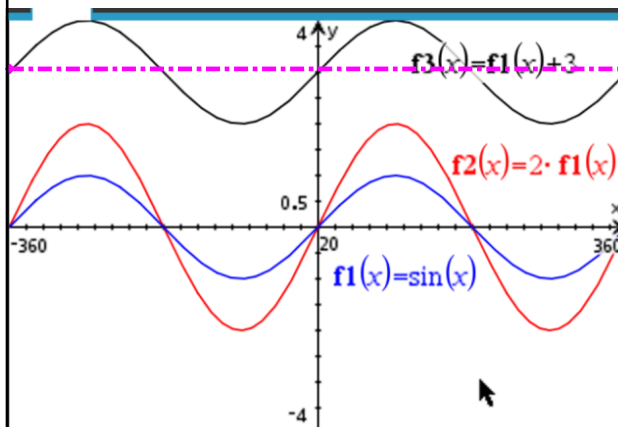
Try On Your Own

Change $f_1(x) = \sin(x)$

Change window setting to "Zoom Trig"

State the Parent Function

State the Transformations



same transformation on Sinusoidal Function

Axis of Symmetry, moved up, $y = 3$ ◆◆◆◆◆

video starts here

Transformations of Functions using Function Notation

$$g(x) = a \cdot f(x) + c$$

The original function

a = Vertical Stretch / Compression / Reflection

c = Vertical Translation

Original $f(x) = 2^x$

Original $f(x) = \sin x$

$0.2 f(x) = 0.2 (2^x)$
 $f(x) - 1.5 = 2^x - 1.5$

$4 f(x) = 4 \cdot \sin x$
 $f(x) - 4 = \sin x - 4$

Worked examples

$$f(x) = \frac{1}{x}$$

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

$$y = 3f(x) - 2$$

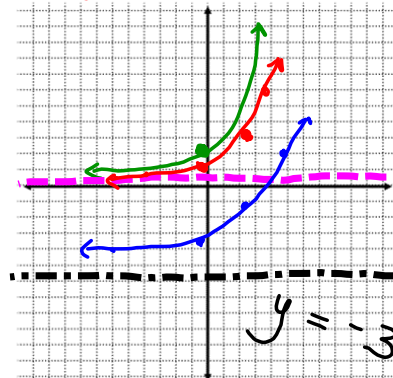
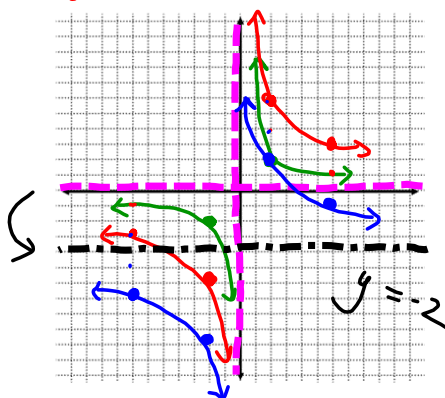
$$y = \frac{1}{2}f(x) - 3$$

V. Stretch
by 3

V. translation
down 2

V. Comp.
by $\frac{1}{2}$

V. T.
down 3



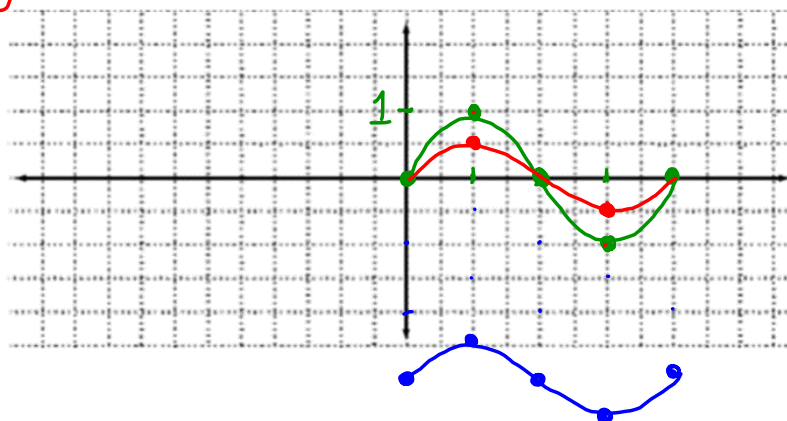
Worked examples

$$f(x) = \sin x$$

$$y = \frac{1}{2}f(x) - 3$$

V. Comp
by $\frac{1}{2}$

V. Translation
down 3



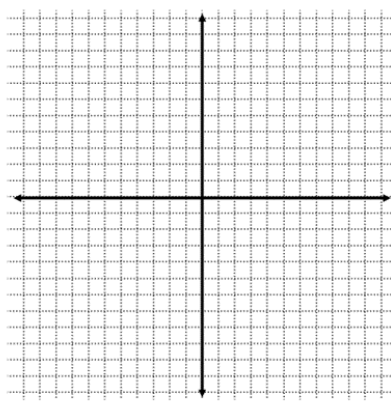
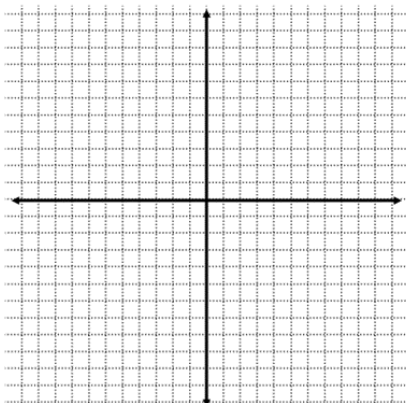
Complete for Practise

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

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

$$y = f(x) + 4$$

$$y = 4f(x)$$



Additional Practise

Complete the Handout

(Check your answer on TI-Nspire)