

Welcome to PreCalculus 12A

Hand out course outline

Skip

<https://safeshare.tv/x/ss5b8eccfa3a060#>

Amy Purdy

<https://www.youtube.com/watch?v=oEVnq6LIKOM>

The Rock

<https://www.youtube.com/watch?v=7BOi0H59tXY>

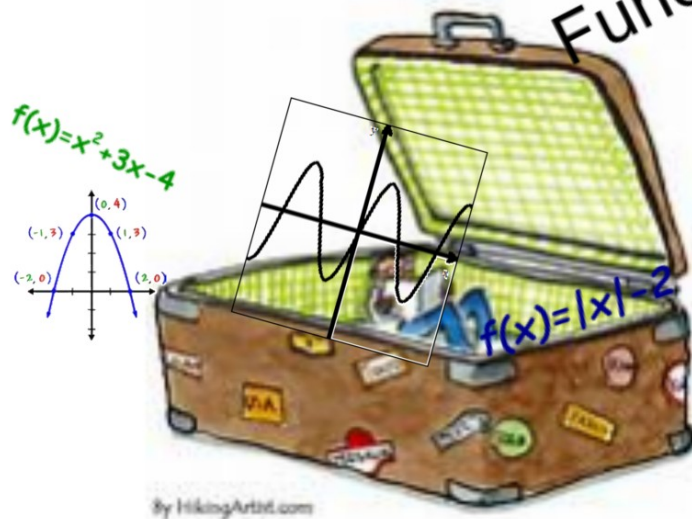
Steve Harvey

Chapter 1

Sketch the unit: parabola, abs value, cubic, linear, etc....

We will be developing a

Function Tool Kit



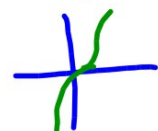
There are many functions we will study:

these are the unit function for each.

quadratic $y=x^2$ $y = (x-6)^2+2$; $y = 3x^2+9x$



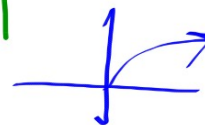
cubic $y=x^3$ $y = 5x^3-9x^2+10x-4$; $y = (x+5)^3$



linear $y=x$ $y = 7x+11$; $y = 5x$



radical $y=\sqrt{x}$ $y = \sqrt{2x+1}$; $y = 5\sqrt{x-2}$



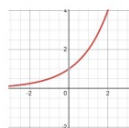
rational $y=\frac{1}{x}$ $y = \frac{2}{x-6}$



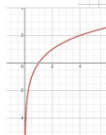
trigonometric $y=\sin x$, $y=\cos x$ etc..



exponential $y=b^x$ $y = 5^x$



logarithmic $y = \log_b x$



general function $y=f(x)$

$y = x^2$

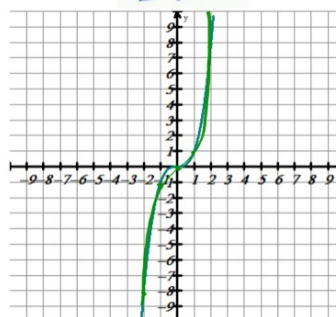
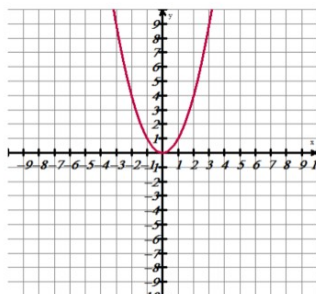
x	4
-2	4
-1	1
0	0
1	1
2	4

Quadratic

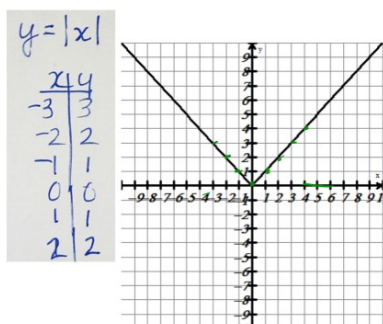
$y = x^3$

x	4
-2	-8
-1	-1
0	0
1	1
2	8

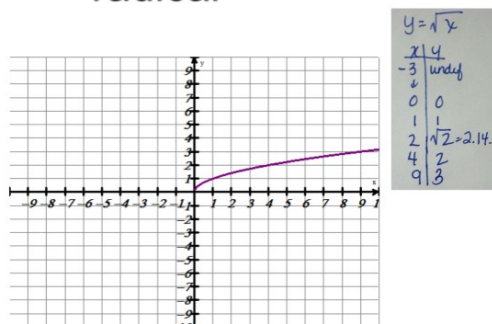
Cubic



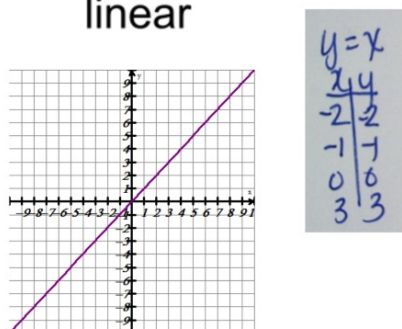
absolute value



radical



linear



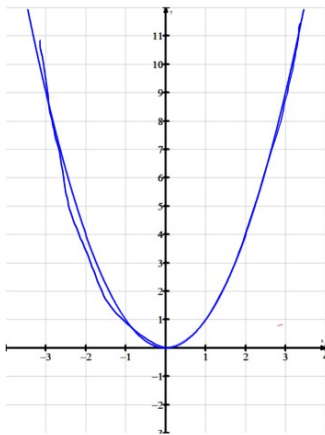
we are going to look at
transformations of these
functions and many more

Transformations refer to horizontal and vertical
-stretches rotations and translations(up, down,
right , left , wider, narrower)

Use Desmos

$$y = x^2$$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

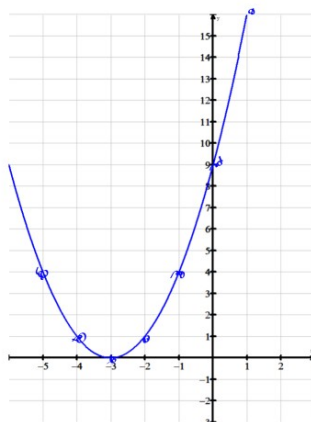


In PreCal 11 you looked at quadratics and noticed some transformations

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

left
3

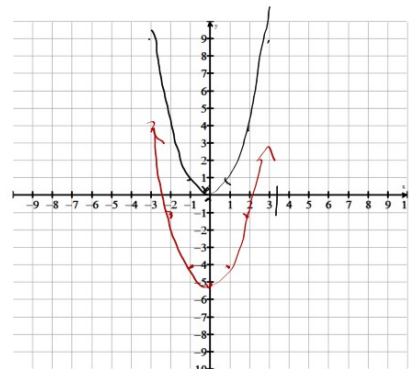
x	y
-5	4
-4	1
-3	0
-2	1
-1	4
0	9
1	16



$$y = x^2 - 5$$

down
5

x	y
-3	4
-2	-1
-1	-4
0	-5
1	-4
2	-1
3	4

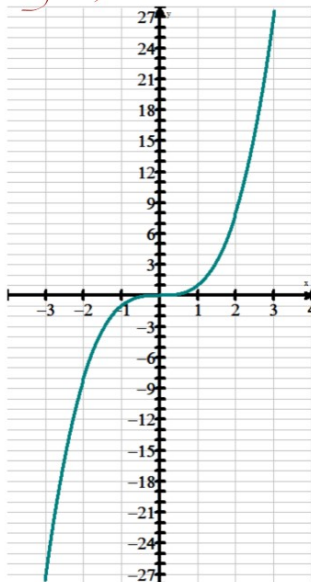


Same is true with cubic and other functions

$$y = x^3$$

x	y
-3	-27
-2	-8
-1	-1
0	0
1	1
2	8
3	27

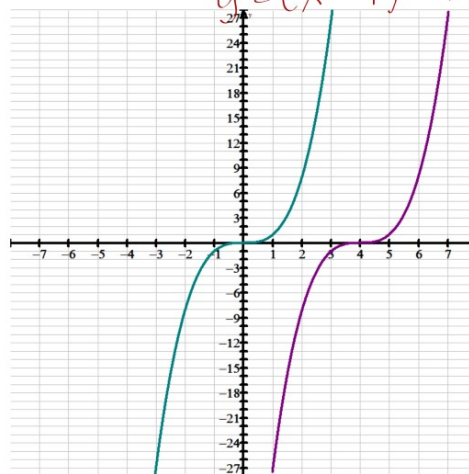
$$y = x^3$$



$$y = (x-4)^3$$

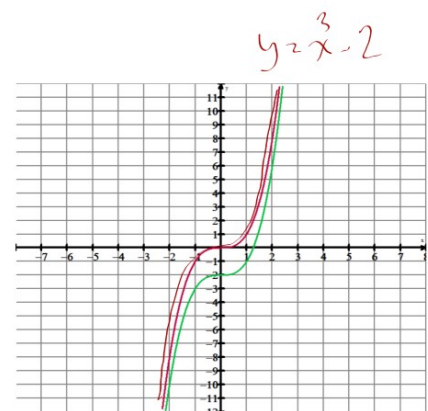
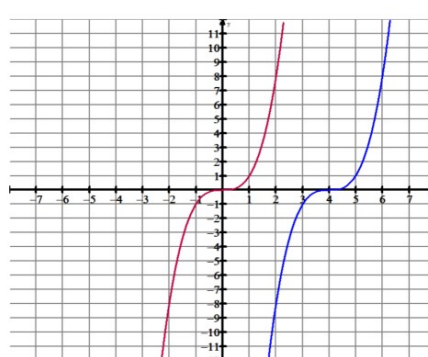
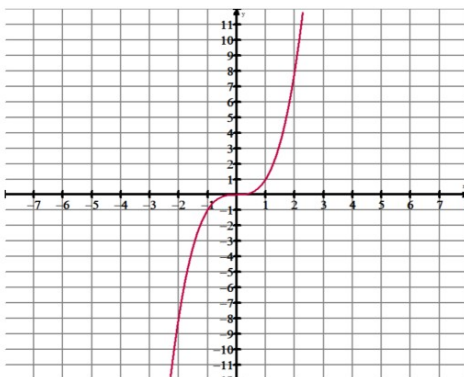
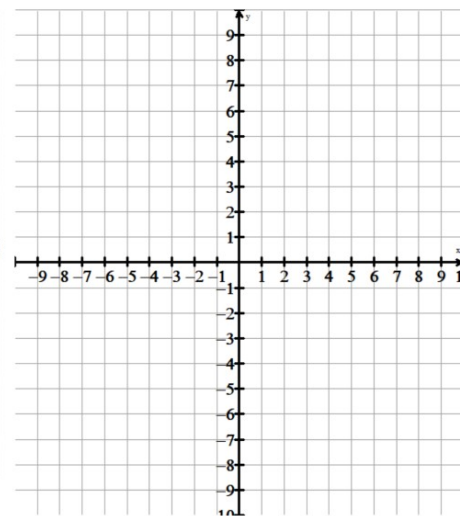
x	y
-3	-216
-2	-125
-1	-64
0	-27
1	-8
2	-1
3	0
4	1
5	8
6	27

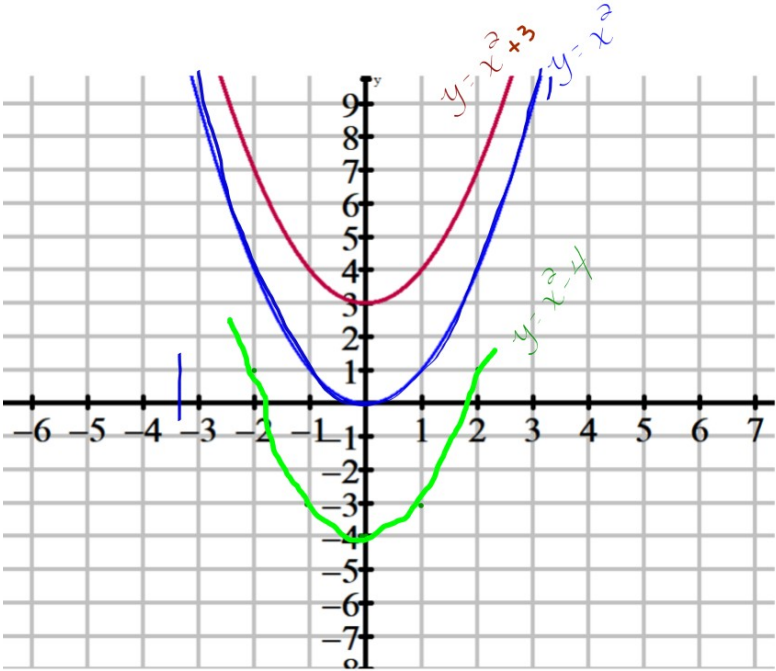
$$y = (x-4)^3$$



$$y = x^3 - 2$$

x	y
-3	-29
-2	-10
-1	-3
0	-2
1	-1
2	6
3	25





Chapter

1

Horizontal and Vertical Translations

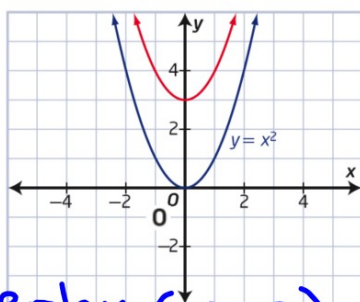
The following graphs are all translations of the function

$$y = x^2.$$

Review from PreCalc 11

$$y = a(x-h)^2 + k \quad \text{Vertex } (h, k)$$

a)

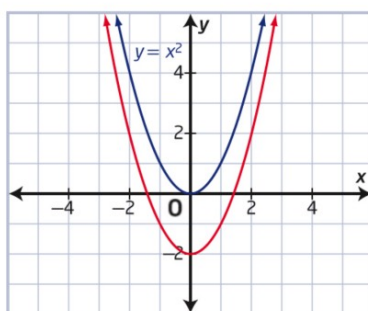


Vertex $(0, 3)$
 h, k



$$y = x^2 + 3$$

$$y = a(x-h)^2 + k$$

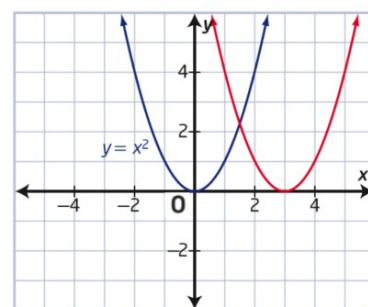


Vertex $(0, -2)$



$$y = x^2 - 2$$

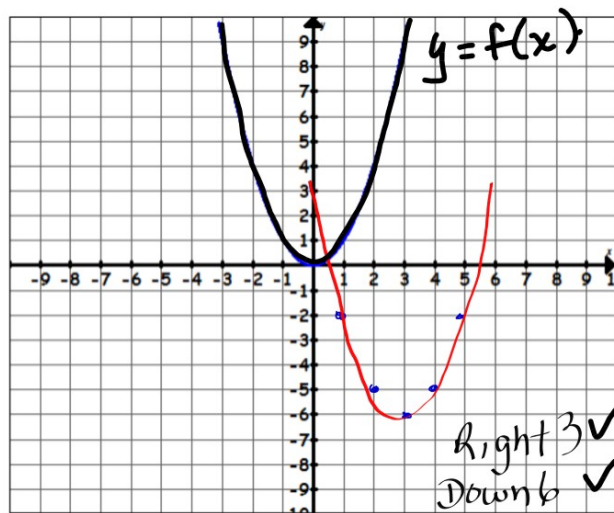
↓



Vertex $(3, 0)$



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



$$y = f(x-3) - 6 \leftarrow D6$$

↖ R3

$$y = (x-3)^2 - 6$$

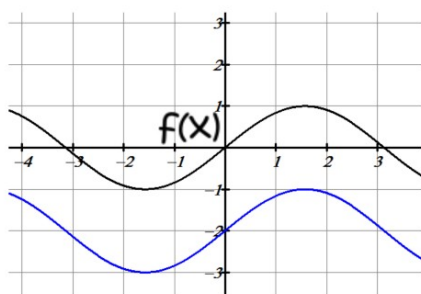
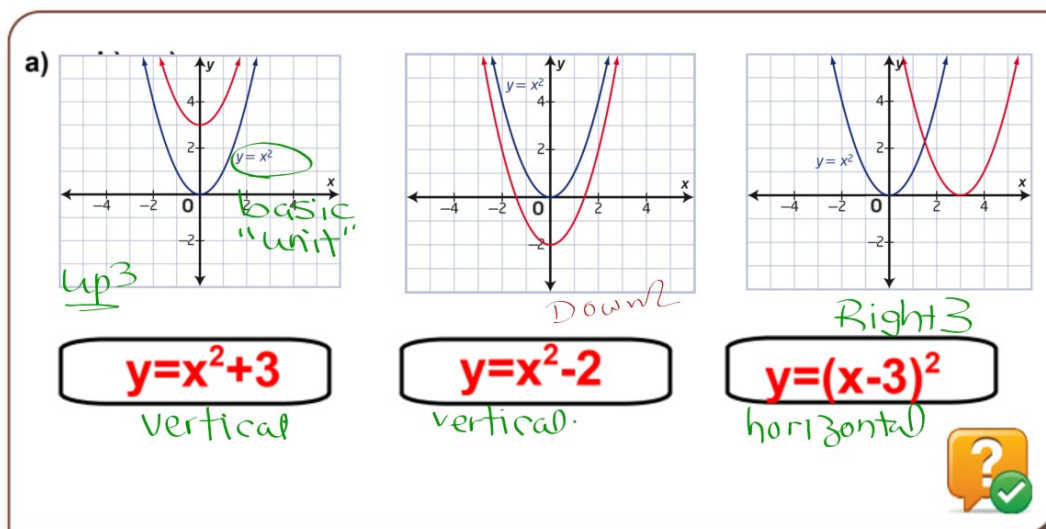
R3
D6

↑ vertex $(3, -6)$
up

Chapter 1

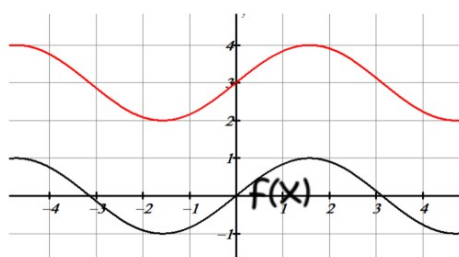
Horizontal and Vertical Translations

The following graphs are all translations of the function $y = x^2$.



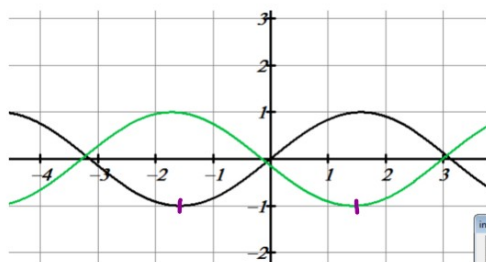
Blue:

Down 2



Red

Up 3



Green

right or left 3

Recall how to find the vertex of a quadratic function by completing the square



$$y=2x^2-12x+65$$

Recall:

Vertex form for a parabola

(h, k) vertex

$$y = a(x-h)^2 + k$$

"h" represents the x coordinate of the vertex

"k" represents the y coordinate of the vertex

h also represents the horizontal translation >> RIGHT of LEFT

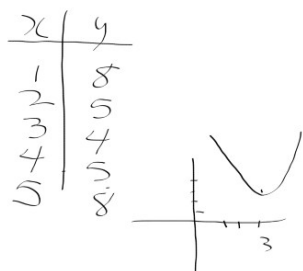
k also represents the vertical translation >> UP of DOWN

"a" refers to the vertical stretch

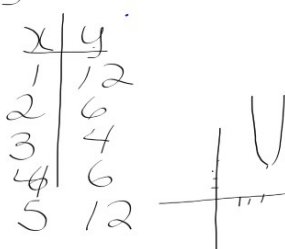
wider or narrower

$$y = a(x-h)^2 + k$$

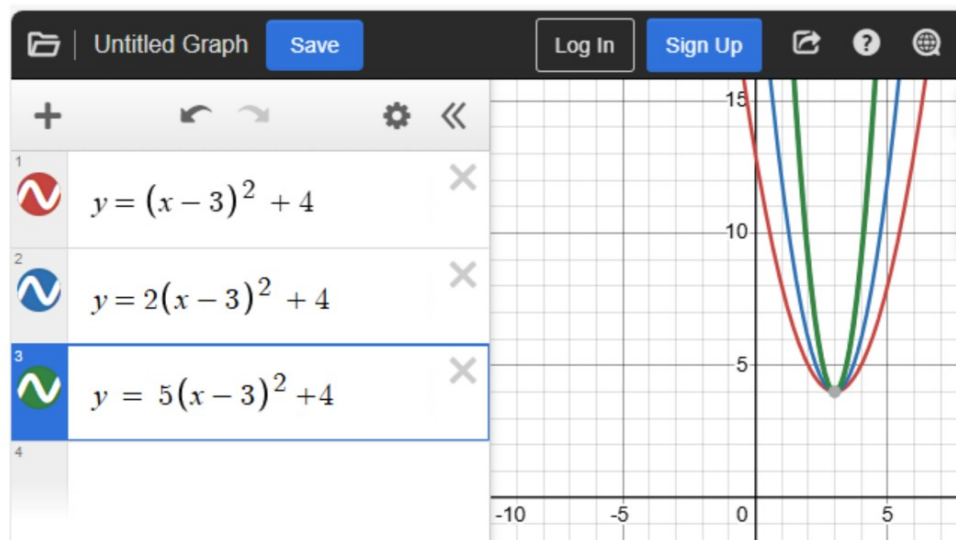
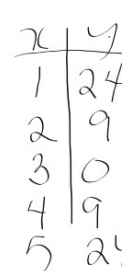
$$y = (x-3)^2 + 4$$



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



$$y = 5(x-3)^2 + 4$$



quadratic functions	$y = a(x-h)^2+k$ 	h, k
cubic functions	$y = a(x-h)^3+k$	h, k
radical function	$y = a\sqrt{x-h} + k$	h, k
rational function	$y = \frac{1}{x-h} + k$	h, k ↑ horizontal ↑ vertical

General function $y=f(x-h) + k$

Horizontal $\longrightarrow$ h
and
Vertical $\uparrow$ k

 	horizontal translation h Right 6	vertical translation k Up 8	horizontal translation left 4 and vertical translation down 7
$y=f(x)$	$y=f(x-6)$	$y=f(x)+8$	$y=f(x+4)-7$
$y=x^2$	$y=(x-6)^2$	$y=x^2+8$	$y=(x+4)^2-7$
$y=x^3$	$y=(x-6)^3$		
$y= x $	$y= x-6 $		
$y=\sqrt{x}$	$y=\sqrt{x-6}$		
$y=\frac{1}{x}$	$y=\frac{1}{x-6}$		
$y=3^x$	$y=3^{x-6}$		
$y=\sin x$	$y=\sin(x-6)$		

Unit Function	Equations of translations	Horizontal & Vertical Translations
$y=f(x)$	$y= f(x-9)-8$	
$y = x^2$	$y= (x+2)^2-6$	
$y = x^3$		HT of 10 Right & VT of 3 up
$y = x $		HT of 10 left & VT of 7 up
$y=$	$y= (x) +4$	
$y =$	$y = x-17 -9$	
$y = 3^x$		
$y=\sqrt{x}$		HT of 1 left VT of 9 up
$y = \sin x$		HT of 8 left VT of 2 down