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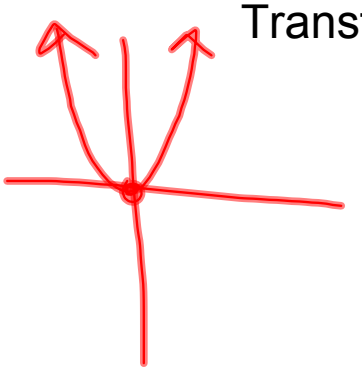
Chapter: Chapter 5:7 --> Transformations with Quadratic Functions

Objectives: Write a quadratic function in the form

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

Transform graphs of quadratic functions

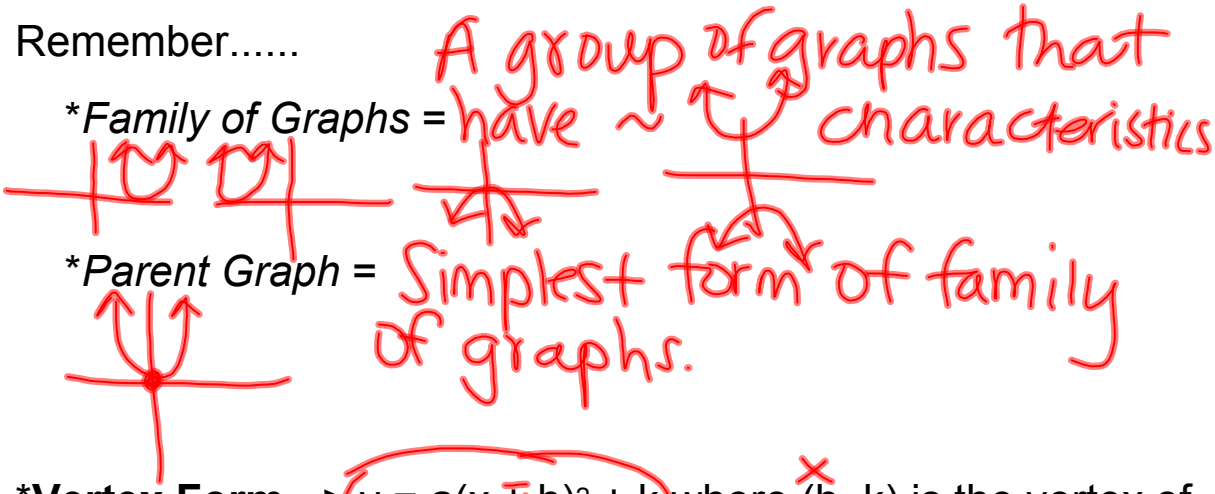


Notes:

Remember.....

*Family of Graphs = A group of graphs that have ~ characteristics

*Parent Graph = Simplest form of family of graphs.



*__Vertex Form__ --> $y = a(x \pm h)^2 \pm k$ where (h, k) is the vertex of the parabola, x = h is the axis of symmetry, and a determines the shape and direction.

Four Types of Transformations

1) Horizontal

($x - h$)^2 --> move right

($x + h$)^2 --> move left

2) Vertical

( )^2 + k --> move up

( )^2 - k --> move down

3) Reflection

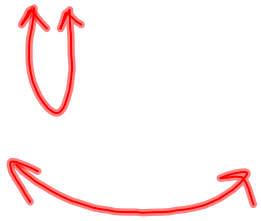
a( )^2 --> opens up

-a( )^2 --> opens down

4) Dilation

a > 1 --> skinny

0 < a < 1 --> fat



Examples:

Ex. 1 - Write each function in vertex form.

a) $y = x^2 + 4x + 6$

$y=(x^2+4x+\underline{4})+6-4$

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

b) $y = 2x^2 - 12x + 17$

$y=2(x^2-6x)+17$

$y=2(x^2-6x+9)+17-18$

$y=2(x-3)^2-1$

c) $y = x^2 + 6x - 5$

$y=(x^2+6x+9)-5-9$

$y=(x+3)^2-14$

d) $y = -2x^2 + 8x - 3$

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

$y=-2(x^2-4x+4)-3+8$

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

Ex. 2 - Write the equation in vertex form of the function.

a)

vertex $(3,2)$

pt. on y $(-1,-2)$ x y

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

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

$-2=a(-1-3)^2+2$

$-2=+16a+2$

$-4=16a$

$-\frac{1}{4}=a$

$y=-\frac{1}{4}(x-3)^2+2$

b)

vertex $=(h,k)$

pt. on $y=(-4,13)$ x y

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

$13=a(-4+1)^2-2$

$13=9a-2$

$15=9a$

$\frac{5}{3}=a$

$y=\frac{5}{3}(x+1)^2-2$

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

Ex. 3 - Graph

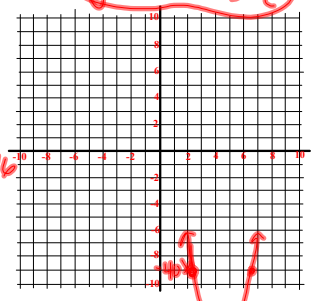
a) $y = 4x^2 - 16x - 40$

$y=4(x^2-4x)-40$

$y=4(x^2-4x+4)-40-16$

$y=4(x-2)^2-56$

vertex $=2,-56$

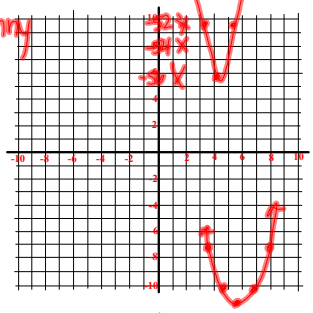


b) $y = (x - 3)^2 - 2$ $a=4\rightarrow$ skinny

x	y
1	-36
2	-52
3	-56
4	-52
5	-40

vertex $=3,-2$

$a=1\rightarrow$ normal

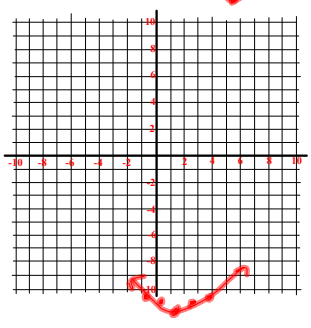


x	y
1	2
3	-2
4	-1
5	2

c) $y = (1/4)(x + 1)^2$

vertex $=-1,0$

$a=\frac{1}{4}\rightarrow$ fat



Homework:

p. 308 (#8-18 Evens, 22-32 Evens, 35-40, 48, 55, 56)