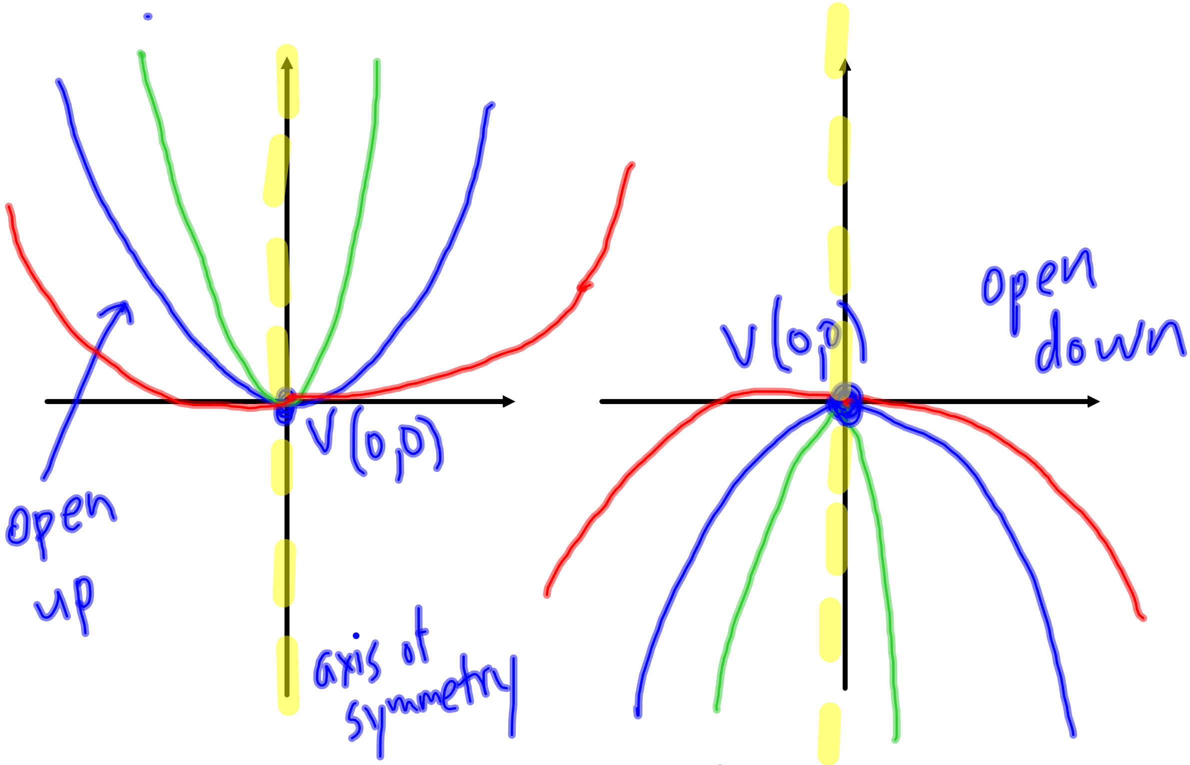
Goal:

- to recognize a second-degree polynomial function (with vertex (0,0)) from a graph, table of values, rule or sentence

- to understand the role of parameter "*a*" in the rule of a second-degree polynomial function

What does the graph of a second-degree polynomial function look like?



This shape is called a parabola

and it has an axis of symmetry (through the y-axis)

the equation for the axis symmetry is . . .

$x = 0$

Below are two tables of values: one representing a linear function the other a second-degree polynomial function

1st degree

x	y
-2	-1
-1	1
0	3
1	5
2	7

+1, +1, +1, +1 ; +2, +2, +2, +2

rate of change $= \frac{+2}{+1} = \frac{2}{1}$

2nd degree

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

+1, +1, +1 ; -3, -1, +1, +3 ; +2, +2, +2

(0,0) ⇒ Vertex

(-2,4) and (2,4) : symmetry

What do you observe that makes them different (other than the fact that the ordered pairs are different)?

We observe that for a second-degree polynomial function the first variations are not constant but the second variations are constant.

Of the two functions listed below which one is a second-degree polynomial function?

x	y
1	-2
2	-8
3	-18
4	-32

-6, -10, -14 ; -4, -4

Second-degree

x	y
1	-2
2	-4
3	-8
4	-16

-2, -4, -12 ; -2, -8

X

Not second-degree

The rule for any second-degree polynomial function can be written as

$$y = ax^2$$ where "a" is a parameter

Here are three examples:

1) $y=3x^2$ — $a=3$

2) $y=-2x^2$ — $a=-2$

3) $y=0.5x^2$ — $a=0.5$

Draw the graph of each function. Use at least 3 points

1)

x	y
0	0
-2	12
2	12

$y = 3(-2)^2 = 3(4) = 12$

2)

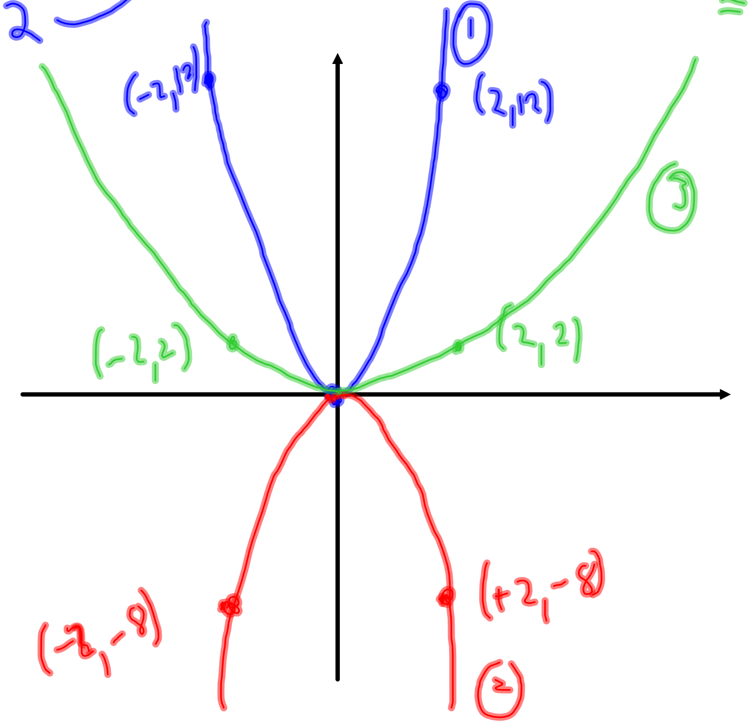
x	y
0	0
-2	-8
2	-8

$y = -2(-2)^2 = -2(4) = -8$

3)

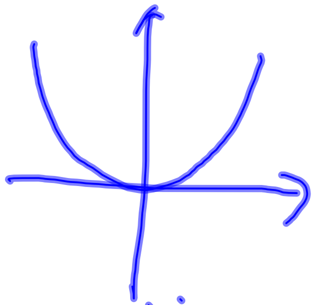
x	y
0	0
-2	2
2	2

$y = 0.5(-2)^2 = 0.5(4) = 2$

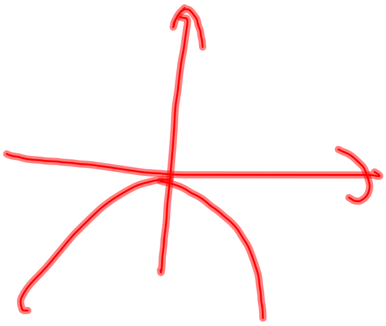


What general observation can be made about how parameter "a" affects the shape of the graph of a second-degree polynomial function?

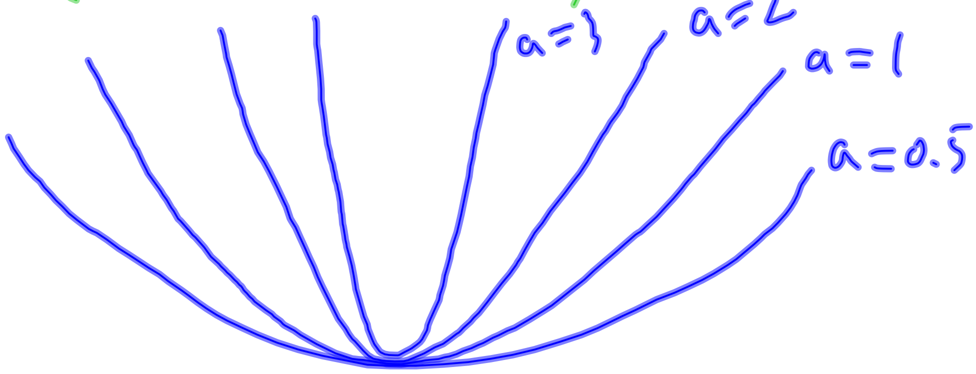
"a" is positive
- parabola opens up
- function is always positive



"a" is negative
- parabola opens down
- function is always negative



The larger the value of "a" the narrower the parabola (vertical stretch)



Homework p.30 #1 (optional)

#2-5 required