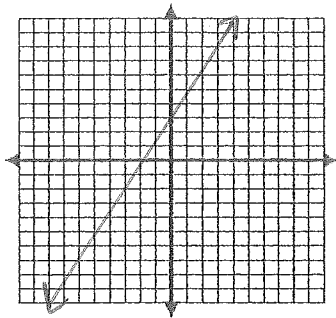


Part 1: What is a quadratic function?

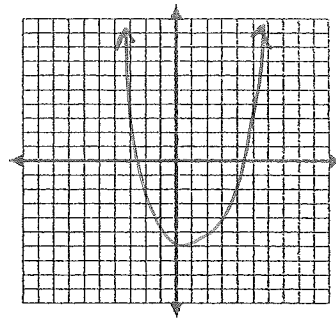
On the grid below graph a linear function



↳ WHAT MAKES A FUNCTION LINEAR?
 • $y = mx + b$
 • FUNCTION FORM

A Linear Function makes a LINE

On the grid below graph a quadratic function



↳ HAS AN x^2

A Quadratic Function makes a PARABOLA

What similarities/differences do you see from the two functions above?

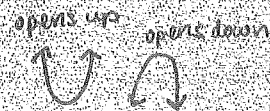
- ↓
- GRAPHS GO ON FOREVER.
 - SHAPE
 - LINES GO ON FOREVER IN OPPOSITE DIRECTIONS, PARABOLAS GO ON FOREVER IN THE SAME DIRECTION

Quadratic Function:

$f(x) = ax^2 + bx + c \Rightarrow$ HAS AN x^2

A Parabola:

THE SHAPE OF THE GRAPH MADE BY A QUADRATIC FUNCTION.



Where have you seen a PARABOLA occur in everyday life?

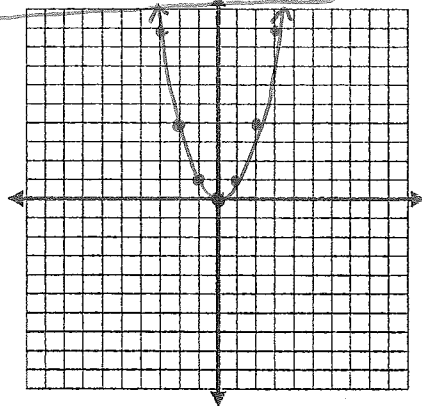
- THROWING A BALL
- ROCKET
- DIVER
- ROLLER COASTER PATH

Basketball Task Day 1 Part 1 – see Task Handout

Part 2: Exploring the graph of a Quadratic Function (Parabola)

PARENT FUNCTION

x	$f(x) = x^2$
-3	
-2	
-1	
0	
1	
2	
3	



Key Parts of a Parabola

1. Vertex: HIGHEST OR LOWEST



POINT ON A PARABOLA

2. Axis of Symmetry: $x =$
 THE "INVISIBLE MIRROR" THAT SPLITS THE PARABOLA IN HALF; THE CURVE IS REFLECTED USING THIS LINE
 EQUATION IS $x =$

3. Maximum: $y =$

THE y-VALUE AT THE VERTEX WHEN THE PARABOLA OPENS DOWN

4. Minimum: $y =$
 THE y-VALUE AT THE VERTEX WHEN THE PARABOLA OPENS UP

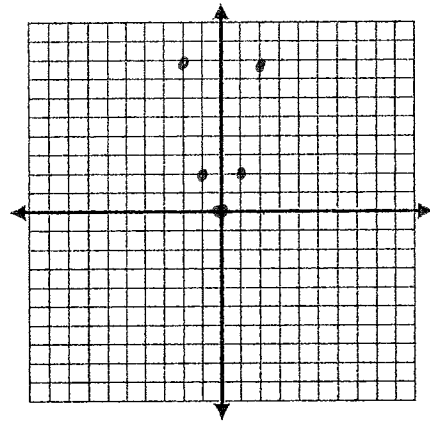
Direction of opening: opens up Maximum/Minimum $y = 0$

Vertex: $(0, 0)$ Axis of Symmetry: $x = 0$
 $x = 0$ $y = 0$

Domain: What x can be anything, so R Range: $y | y \geq 0$ (y is positive)

Examples: **Think ahead!! Be sure to plug in values for x that make the computation easy!!**

x	-2	-1	0	1	2
$f(x) = 2x^2$	8	2	0	2	8

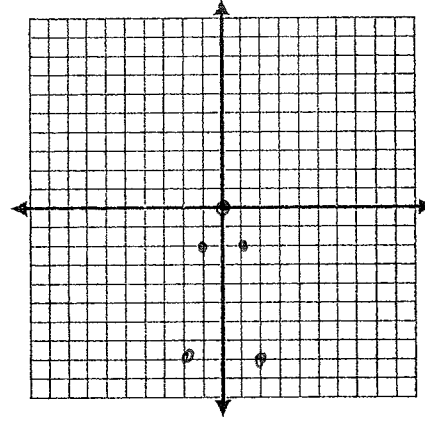


Direction of opening: opens up Maximum/Minimum: $y=0$

Vertex: $(0, 0)$ Axis of Symmetry: $x=0$
 $x=0$ $y=0$

Domain: all real numbers Range: y has to be positives

x	-2	-1	0	1	2
$f(x) = -2x^2$	-8	-2	0	-2	-8



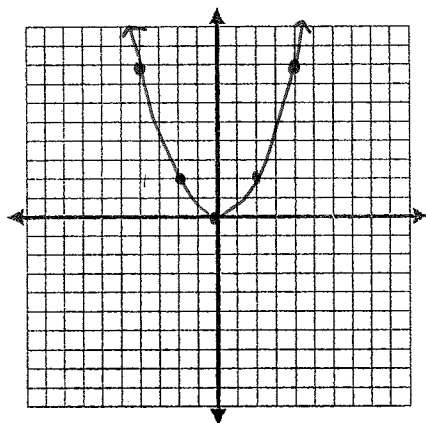
Direction of opening: opens down Maximum/Minimum:

Vertex: $(0, 0)$ Axis of Symmetry: $x=0$
 $x=0$ $y=0$

Domain: all real numbers Range: y has to be negative $\{y | y \leq 0\}$

CHOOSE EVENS

x	-4	-2	0	2	4
$f(x) = \frac{1}{2}x^2$	8	2	0	2	8

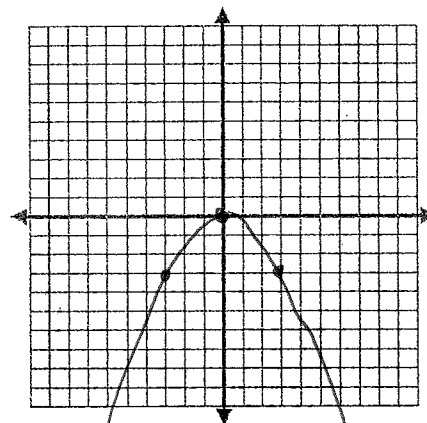


Direction of opening: opens up Maximum/Minimum: $y=0$

Vertex: $(0, 0)$ Axis of Symmetry: $x=0$
 $x=0$ $y=0$

Domain: Range:

x	-6	-3	0	3	6
$f(x) = -\frac{1}{3}x^2$	-12	-3	0	-3	-12



Direction of opening: opens down Maximum/Minimum: $y=0$

Vertex: $(0, 0)$ Axis of Symmetry: $x=0$
 $x=0$ $y=0$

Domain: Range:

Summarize your observations about the graph $y = ax^2$

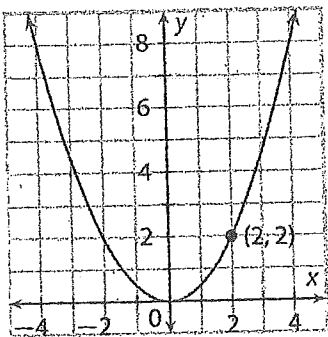
For these values of a :	The function $f(x) = ax^2$ is a vertical:	The graph opens:
$a = 1$	NO SHRINK / STRETCH	opens up
$a = -1$	NO SHRINK / STRETCH	opens down
$a > 1$	STRETCH (NARROW)	opens up
$0 < a < 1$	SHRINK (FLATTER)	opens up
$-1 < a < 0$	SHRINK (FLATTER)	opens down
$a < -1$	STRETCH (NARROW)	opens down

IF a IS fraction less than 1

Basketball Task Day 1 Part 2 – see Task Handout

Write the rule of a Quadratic Function (Parabola) WHEN ORIGIN IS VERTEX

Example 1:



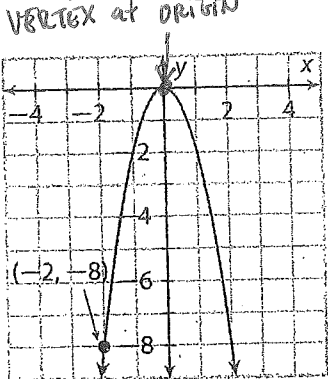
THE FUNCTION WILL LOOK LIKE $f(x) = ax^2$.

- 1). $(2, 2)$
x y
- 2). $f(x) = ax^2$
- 3). $2 = a(2^2)$
- 4). $2 = 4a$
 $\frac{2}{4} = \frac{4a}{4}$
 $\frac{1}{2} = a$
- 5). $f(x) = \frac{1}{2}x^2$

Steps:

1. Use A POINT ON CURVE
2. Start with the function form: $f(x) = ax^2$
3. Replace x and f(x) with the point values.
y
4. Solve for a.
5. Write the FUNCTION RULE USING: THE a value of
-keep $f(x)$ as $f(x)$
-keep x as x

Example 2:



- $(-2, -8)$
- $f(x) = ax^2$
- $-8 = a(-2^2)$
- $-\frac{8}{4} = \frac{4a}{4}$
- $-2 = a$

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

Example 3:

Satellite dishes reflect radio waves onto a collector by using a reflector (the dish) shaped like a parabola. The graph shows the height h in feet of the reflector relative to the distance x in feet from the center of the satellite dish. Write the function using the equation $h(x) = ax^2$

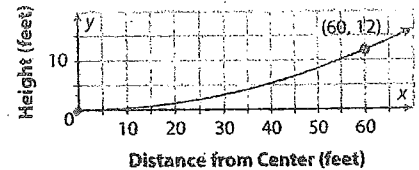
$(60, 12)$

$f(x) = ax^2$

$12 = a(60^2)$

$\frac{12}{3600} = \frac{3600a}{3600}$

$\frac{1}{300} = a$



$f(x) = \frac{1}{300}x^2$

Ticket out the door:

Create your own quadratic function. Does it open up or down? Is it a vertical stretch, shrink or neither?

