

## Introduction to the Quadratic Relation

We can represent a mathematical relationship using an equation, table or graph.

In a table of values, we can calculate finite differences:

- the first differences represent changes in the y-values
- the second differences represent changes in the first differences

Linear relation

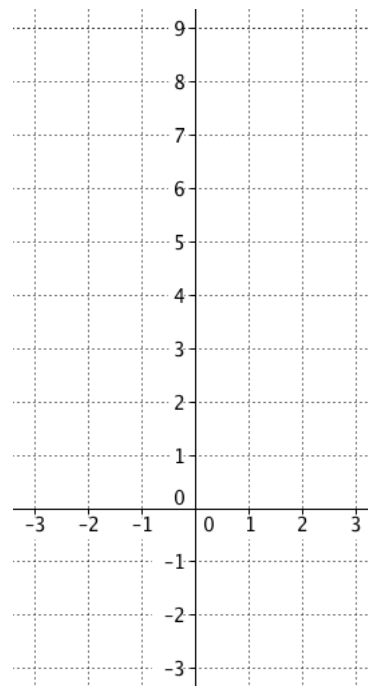
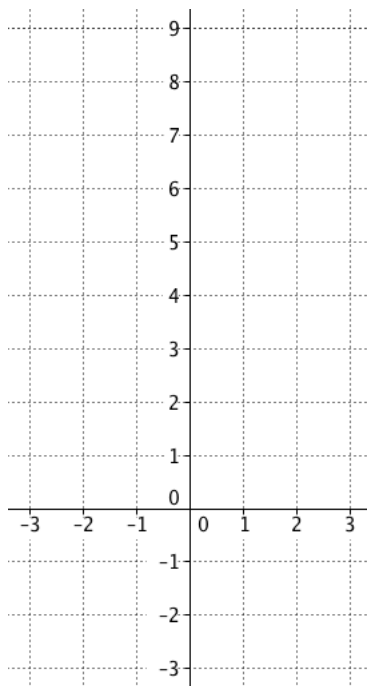
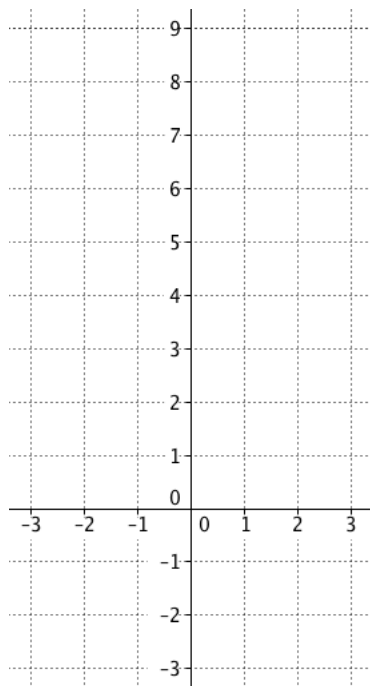
x	$y = x$	1st	2nd
-3			
-2			
-1			
0			
1			
2			
3			

Quadratic relation

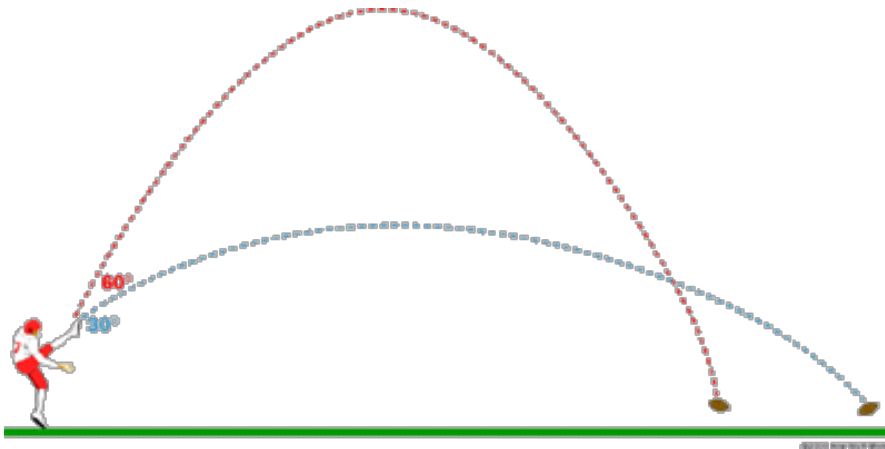
x	$y = x^2$	1st	2nd
-3			
-2			
-1			
0			
1			
2			
3			

Exponential relation

x	$y = 2^x$	1st	2nd
-3			
-2			
-1			
0			
1			
2			
3			



One of the most common examples of a quadratic relation is the motion of a projectile, such as a football after it has been kicked:



We can describe the properties of a quadratic relation using the following definitions:

Axis of Symmetry: The \_\_\_\_\_ line in which the graph is a reflection of itself.

Vertex: The point at which the graph intersects the axis of symmetry or the \_\_\_\_\_ or \_\_\_\_\_ point.

Domain: The set of first elements ( \_\_\_\_\_ ) for the relation.

Range: The set of second elements ( \_\_\_\_\_ ) for the relation.

We can show that this relationship is not linear (the slope is not constant) using:

Over 1 Points: The points on the parabola that are \_\_\_\_\_ from the vertex

Over 2 Points: The points on the parabola that are \_\_\_\_\_ from the vertex.

We will learn three forms in which we can write the equation for a quadratic relation:

➤ vertex form  $y = a(x - h)^2 + k$

➤ x-intercept form  $y = a(x - r)(x - s)$

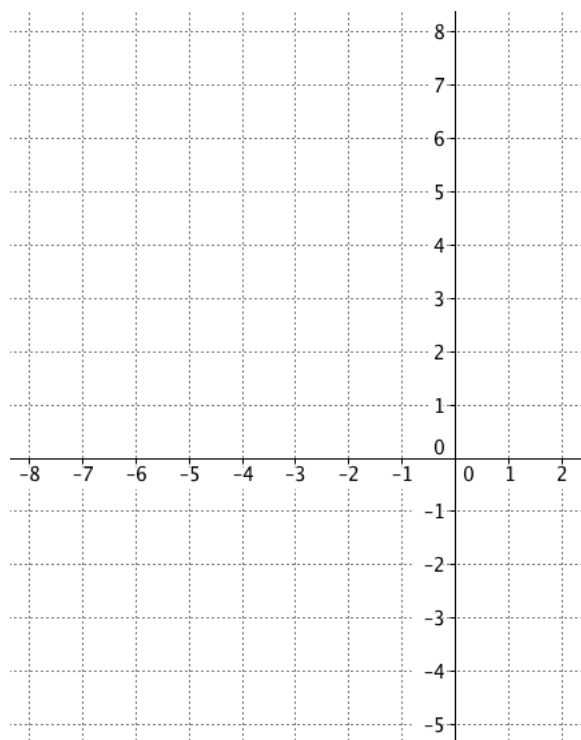
➤ standard form  $y = ax^2 + bx + c$

Example – A quadratic relation is modeled by the equation  $y = -0.5(x + 3)^2 + 8$ .

a) Rewrite this quadratic relation in standard form.

b) Fill in the missing information in the table of values for this quadratic relation, and plot the points accurately on the grid provided.

x	y
-8	-4.5
-7	0
-6	3.5
-5	6
-4	
-3	8
-2	
-1	
0	3.5
1	0
2	-4.5



d) Summarize the properties this quadratic relation in the chart below.

Vertex	Over 1 Points	Over 2 Points	Max/Min Point	Max/Min Value	Axis of Symmetry	Domain	Range

Homework – Complete each of the tables below to summarize the properties of the quadratic relations on the attached handout.

#	Vertex	Over-1 Points	Over-2 Points	Max/Min Point	Max/Min Value	Axis of Symmetry	Domain	Range
a								
b								
c								
d								
e								
f								

#	Vertex	Over-1 Points	Over-2 Points	Max/Min Point	Max/Min Value	Axis of Symmetry	Domain	Range
a								
b								
c								
d								
e								
f								