

Date: _____



3.1 Exploring Quadratic Relations

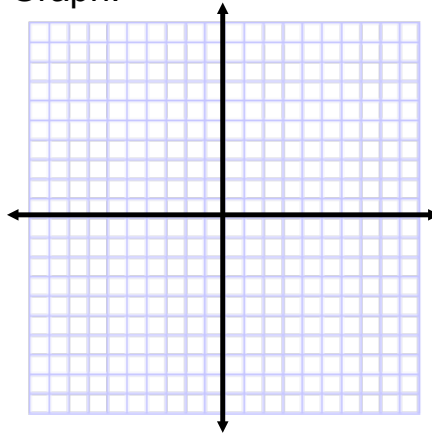
Bellwork:

- 1) How can you tell if a relationship is linear using a table of values, graph, and equation?

Table:

x	y
-2	7
-1	3
0	-1
1	-5
2	-9

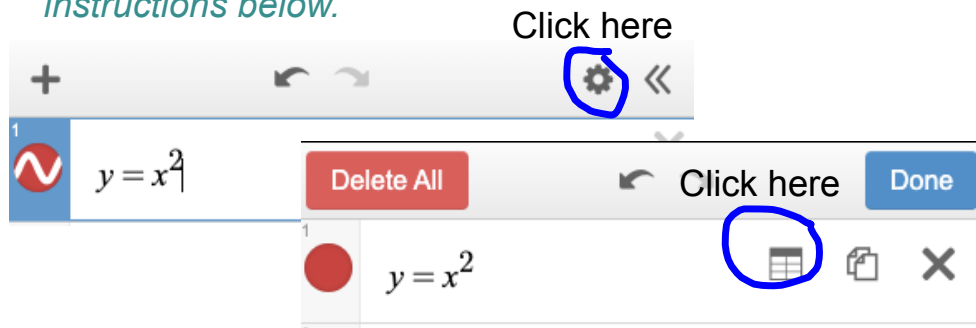
Graph:



Equation:

- 2) Turn to p. 134 in your text book and use Desmos (ignore all of the graphing calculator instructions, just open the Desmos app or go to [desmos.com](https://www.desmos.com) and type in the equation) to help you complete parts A and B.

To see the table that goes with your graph in Desmos, follow the instructions below.



- 3) Use your knowledge of first differences (the difference in the y-values in a table) to complete C and D.

3.1 Exploring Quadratic Relations



You spent lots of time learning about different representations of linear relationships in grade nine. This year, we are going to take that understanding one step further and learn about "quadratic relationships".

1) Finite Differences

first differences - the differences in the y - values of a relation

First differences allow us to conclude if a relationship is linear or not (equal = linear; not equal = not linear).

Finite differences are simply the differences of the differences. For example, if I subtract my first differences from each other, I can find second differences, and so on.

ex/ Calculate the second differences for the table provided.

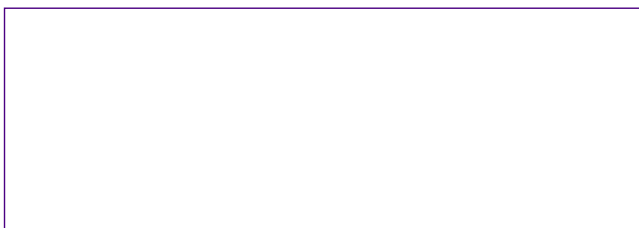
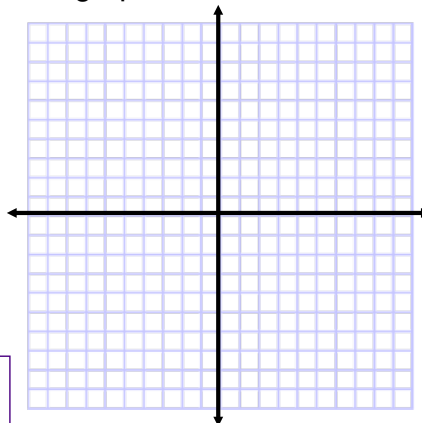
x	y
-2	16
-1	9
0	4
1	1
2	0

When our second differences are **EQUAL**, the relationship is **QUADRATIC**.
When our second difference are **NOT EQUAL**, the relationship is **NEITHER** linear nor quadratic.

2) Curve of Best Fit

We already know that a linear relation forms a line on a graph. Quadratic relations also have a characteristic graph. Let's graph the table from the previous example to see what it looks like.

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



3) Finding the "Degree" of a Polynomial

degree - the highest sum of the exponents **IN ANY ONE TERM** in a polynomial expression

To determine the degree of an expression:

- expand and simplify as much as you can;
- add up all of the variable's exponents in **EACH TERM**; the highest total wins, determining the degree of the expression.

ex/ Find the degree of each of the following:

a) $6x^2 - 2x - 5$

b) $2x(x + 3)$



What does the degree tell us about a relationship?

- All linear relations ($y = mx + b$) are _____ degree.
- All quadratic relations are _____ degree.

Now complete parts E to G and K to M in the activity we started for bellwork. You can put all of the graphs for Part E in to Desmos at once, and just look at them. Repeat for Parts F and G. Parts K to M ask you to think about what you saw. Your findings will help you with the text book questions!