Name: _____ Date: _____ MFM 2P1

CHAPTER 6: Quadratic Relations

DAY	*SECTION / TOPIC*	*SEATWORK / HOMEWORK*
1	6.1 - Explore Non-Linear Relations	Page 241 – 244 #1 – 3, 6
2	6.3 - Key Features of Quadratic Relations	Page 260 – 263 #1, 3 (create a table of values and graph), 4, 6
3	6.4 - Rates of Change in Quadratic Relations	Page 269 – 271 #1, 2, 3a – d, 5
4	Review	Page 272 – 273 #1, 2, 4 (use table of values), 5, 7
5	**CHAPTER 6 TEST**	

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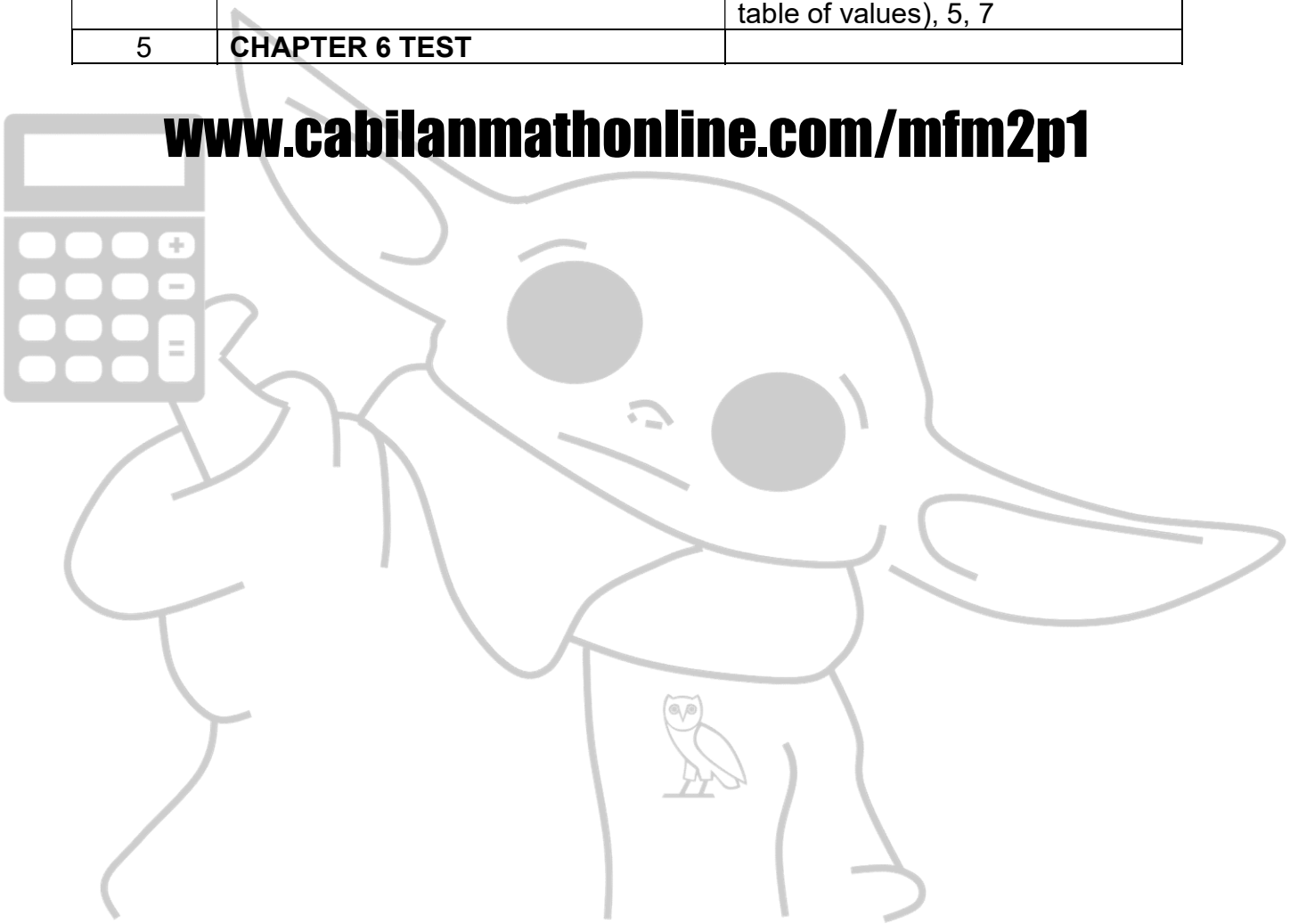
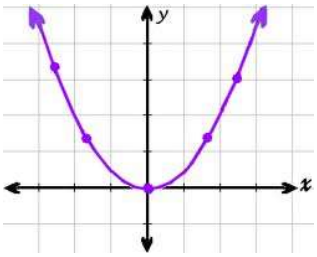


Name: _____ Date: _____ MFM 2P1

6.1 – EXPLORE NON-LINEAR RELATIONS

KEY CONCEPTS



A **quadratic relation** is one type of *non-linear* relation.
→an equation that describes a parabola
→an equation of the form $y = ax^2 + bx + c$, where $a \neq 0$

The graph of a quadratic relation is called a **parabola**, which is a *symmetrical* U-shaped graph

EXAMPLE 1 *Drawing a Line or Curve of Best Fit*

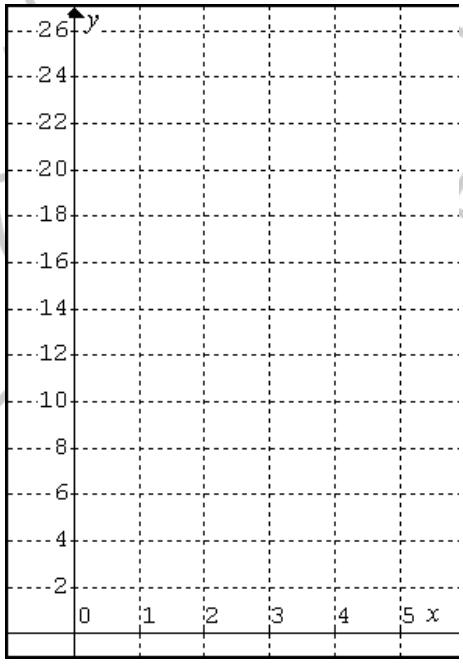
Graph the data in each table. Draw a **line** or **curve** of best fit. Explain your reason

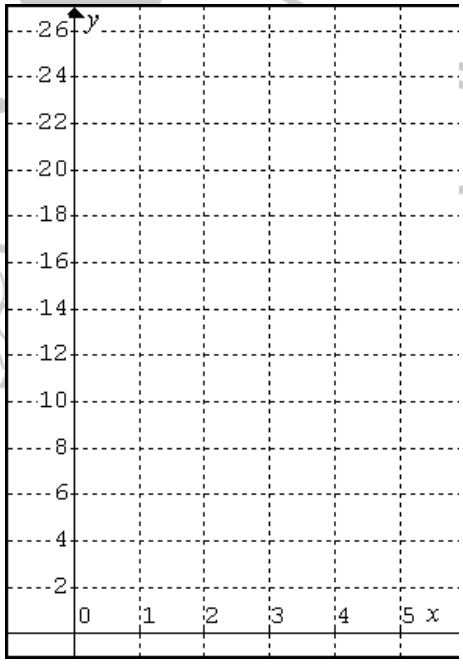
(a)

x	*y*
0	2
1	6
2	10
3	14
4	18
5	22

(b)

x	*y*
0	24
1	6
2	0
3	6
4	24





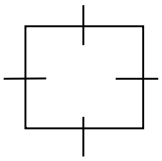
Explanation:

Explanation:

Name: _____ Date: _____ MFM 2P1

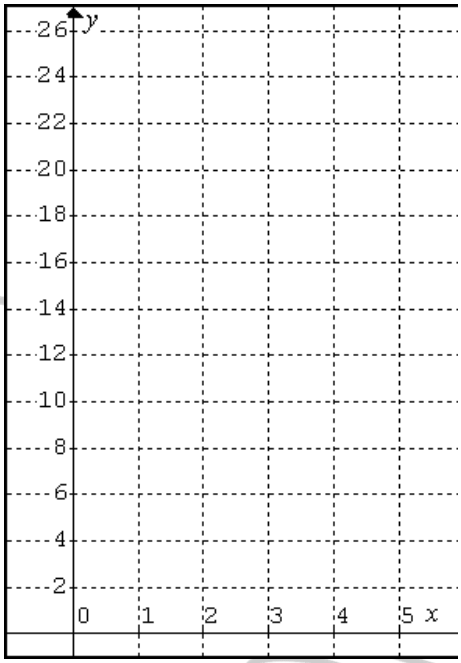
EXAMPLE 2 *Area of a Square*

The formula for the area of a square is $\mathbf{A = s^2}$, where *s* represents the side length of a square.



Complete the table below and draw a smooth curve through all the points.

Side length (cm)	***A = s^2 (in cm^2)***
0	
1	
2	
3	
4	
5	



Homework:
Page 241 – 244 #1 – 3, 6

Name: _____ Date: _____ MFM 2P1

6.3 – KEY FEATURES OF QUADRATIC RELATIONS

KEY CONCEPTS

For a quadratic relation in the form $\mathbf{y = ax^2 + bx + c}$, where $\mathbf{a \neq 0}$

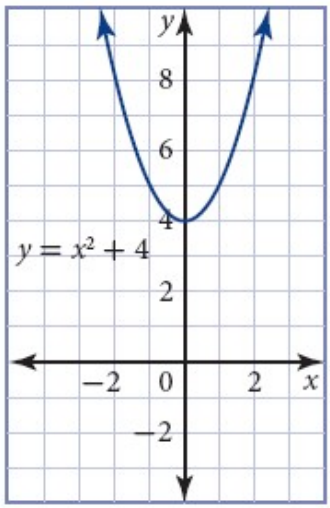
If the *a* value is positive, the parabola opens upward and has a **minimum** value.
If the *a* value is negative, the parabola opens downward and has a **maximum** value.

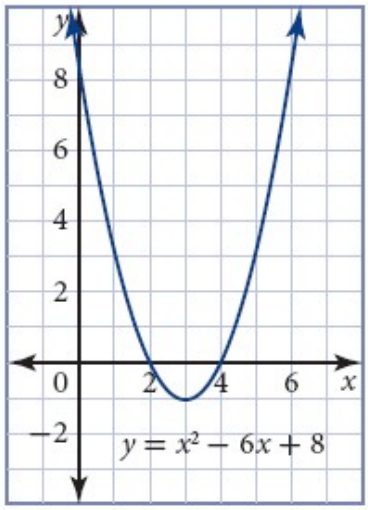
The **vertex** of a parabola is the point at which the parabola changes from decreasing to increasing or from increasing to decreasing.

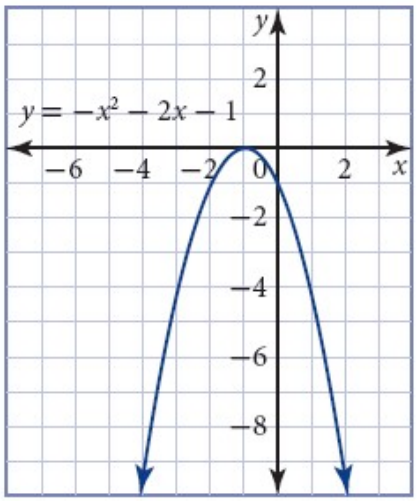
The **maximum** or **minimum** value is the *y*-coordinate of the vertex.

The **axis of symmetry** is the vertical line that passes through the vertex.
→ the equation of the axis of symmetry is $x = p$, where p is the x-coordinate of the vertex

The ***x*-intercepts** are the *x*-coordinates of the points at which the parabola crosses the *x*-axis.
→ A parabola may have **zero**, **one**, or **two** *x*-intercepts.

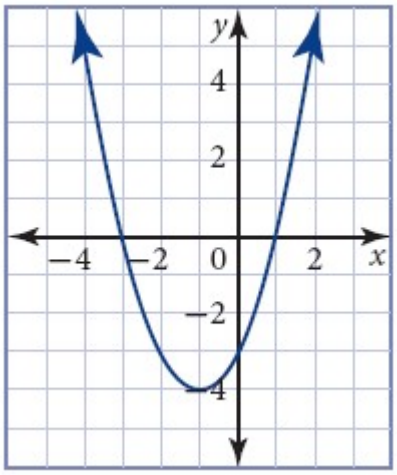






Name: _____ Date: _____ MFM 2P1

EXAMPLE 1
Identifying Features of a Quadratic Relation, Graph Given



(a) For the graph on the *right*,

1. Identify the **coordinates** of the vertex

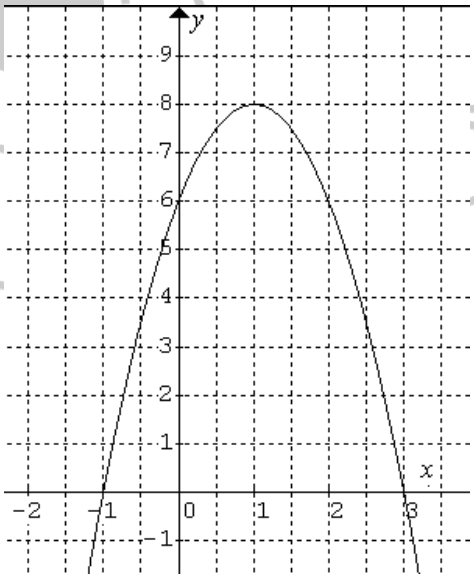
2. The equation of **axis of symmetry**

3. The **y-intercept**

4. (a) Is it a **minimum** or **maximum**? _____
   (b) What is the value? _____

5. (a) How many **x-intercepts**? _____
   (b) What is it/what are they? _____

(b) For the graph on the *right*,



1. Identify the **coordinates** of the vertex

2. The equation of **axis of symmetry**

3. The **y-intercept**

4. (a) Is it a **minimum** or **maximum**?
   _____
   (b) What is the value? _____

5. (a) How many **x-intercepts**? _____
   (b) What is it/what are they? _____

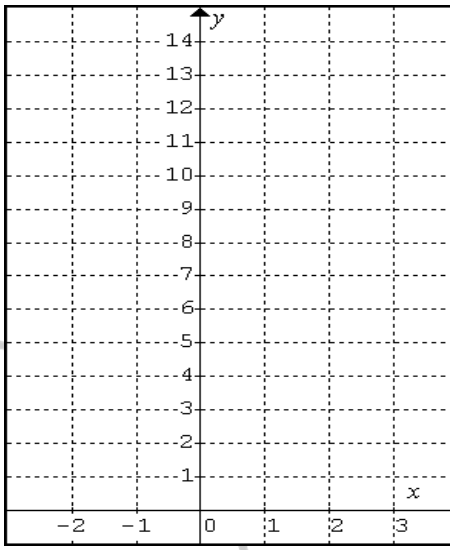
Name: _____ Date: _____ MFM 2P1

EXAMPLE 2 *Key Features of a Quadratic Relation, Equation Given*

A quadratic relation is given by the equation $\mathbf{y = x^2 - 2x + 3}$.

1. Complete the table of values then graph the data.

x	*y*
– 2	
– 1	
0	
1	
2	



2. Identify the **coordinates** of the vertex

3. The equation of **axis of symmetry**

4. The **y-intercept**

5. (a) Is it a **minimum** or **maximum**? _____
   (b) What is the value? _____

6. (a) How many **x-intercepts**? _____
   (b) What is it/what are they? _____

Homework:
Page 260 – 263 #1, 3 (create a table of values and graph), 4, 6

Name: _____ Date: _____ MFM 2P1

6.4 – RATES OF CHANGE IN QUADRATIC RELATIONS

KEY CONCEPTS

A quadratic relation can be represented by an equation of the form $y = ax^2 + bx + c$, where $a \neq 0$.

The graph of a quadratic equation has the shape of a **parabola**.

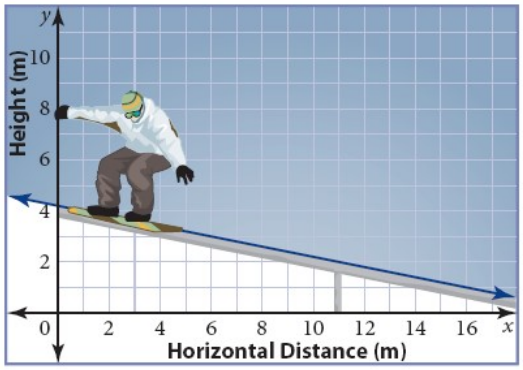
A quadratic relation has **constant second differences**.
→the difference between consecutive first differences

EXAMPLE *First and Second Differences in Quadratic Relations*

A snowboarder makes two runs

PART 1:

In the first run, the snowboarder travels down a ramp to the bottom of the slope.



For this run, the graph comparing height to the horizontal distance from the starting point is **linear**.

(a) Complete the table below and calculate the **first differences**.

Horizontal distance , in metres(x)	*Height, in metres (y)*	*1st Diff.*
1	4.0	
2	3.8	
3	3.6	
4	3.4	
5	3.2	
6	3.0	

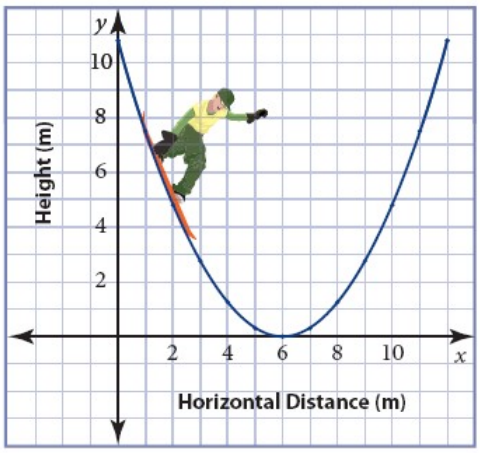
Name: _____ Date: _____ MFM 2P1

(b) What do you notice about the *first differences*

SUMMARY:
When first differences are _____, the relationship is _____. The graph of this type of a relationship is a _____.

PART 2:

In the second run, the snowboarder travels down one side of a parabolic curve and up the other.



For this run, graphing height against horizontal distance from the starting point produces a parabola.

(a) Complete the table below by calculating the **first** and **second differences**

Horizontal distance, in metres (x)	*Height, in metres (y)*	*1st Diff.*	*2nd Diff.*
0	10.8		
1	7.5		
2	4.8		
3	2.7		
4	1.2		
5	0.3		
6	0		
7	0.3		
8	1.2		
9	2.7		
10	4.8		
11	7.5		
12	10.8		

(b) What do you notice about the *first differences*?

Since the *first differences* are _____, this relationship is <u>not</u> _____

(c) What do you notice about the *second differences*?

SUMMARY:
When the *second differences* are _____, the relationship is _____.
The graph of this type of relationship is called a _____.

<u>Homework</u>:
Page 269 – 271 #1, 2, 3a – d, 5