

Course: MFM2P Gr. 10 AppliedLesson: 6-4Unit: Quadratic RelationsTopic: Rates of Change in Quadratic Relations

✚ *homework check:* Lesson 6 - 3

✚ *note:* Rates of Change in Quadratic Relations

Recall from unit three that linear relations have a constant rate of change. We can find that rate of change by calculating the first differences. When the first differences are not constant, we know that the relation is not linear. We can go further by calculating the second differences to see if the non-linear relation might be quadratic. When the second differences are constant, the relation is quadratic. For example, determine what kind of relation is given.

a)

x	y	first differences	second differences
-2	-2	$3 - (-2) = 5$	$3 - 5 = -2$
-1	3	$6 - 3 = 3$	$1 - 3 = -2$
0	6	$7 - 6 = 1$	$-1 - 1 = -2$
1	7	$6 - 7 = -1$	$-3 - (-1) = -2$
2	6	$3 - 6 = -3$	
3	3		

Here, the second differences are constant, so this relation is quadratic.

b)

x	y	first differences	second differences
-2	8	$5 - 8 = -3$	*not needed
-1	5	$2 - 5 = -3$	
0	2	$-1 - 2 = -3$	
1	-1	$-4 - (-1) = -3$	
2	-4	$-7 - (-4) = -3$	
3	-7		

Here, the first differences are constant, so this relation is linear (and second differences are not needed).

c)

x	y	first differences	second differences
-2	5	$4 - 5 = -1$	$-2 - (-1) = -1$
-1	4	$2 - 4 = -2$	$-1 - (-2) = 1$
0	2	$1 - 2 = -1$	$1 - (-1) = 2$
1	1	$2 - 1 = 1$	
2	2		

Here the second differences are not constant, so this relation is non-linear, but not quadratic.

✚ homework assignment: Lesson 6 - 4

Lesson 6 – 4: Rates of Change in Quadratics

Mark (/41): _____

1. Complete the table of values for each. (12 marks)

a)

x	$y = x^2 - 6x + 8$
0	
1	
2	
3	
4	
5	

b)

x	$y = x^2 + 7x + 12$
-7	
-6	
-5	
-4	
-3	
-4	

2. Determine is each relation is linear, quadratic, or neither. (8 marks)

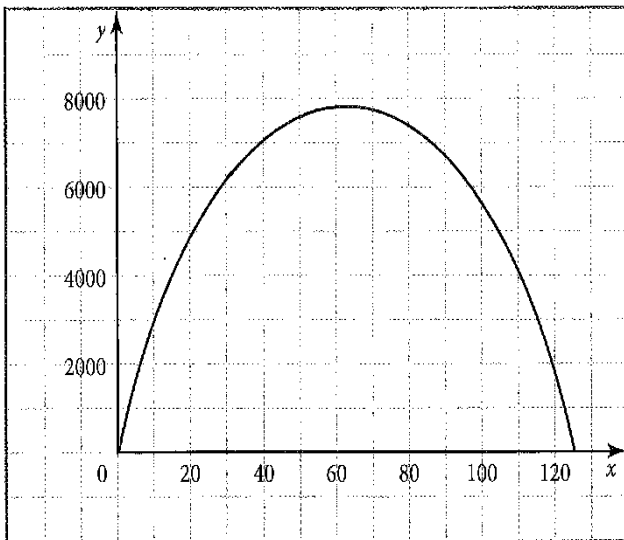
a)

x	y	first differences	second differences
1	9		
2	4		
3	1		
4	0		
5	1		
6	4		

b)

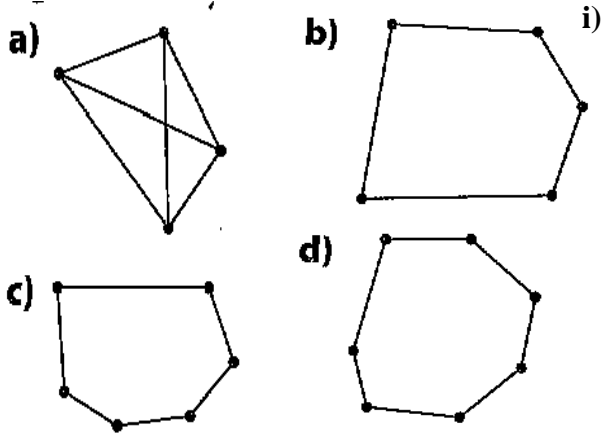
x	y	first differences	second differences
-2	2		
-1	1		
0	0		
1	1		
2	2		
3	4.5		

3. The graph below shows a quadratic relation. Complete the table of values, first and second differences table. Remember, the graph is quadratic. Be careful! (4 marks)



x	y	first differences	second differences
0			
20			
40			
60			
80			
100			

4. For any 4-sided polygon, two diagonal lines can be drawn. (12 marks)

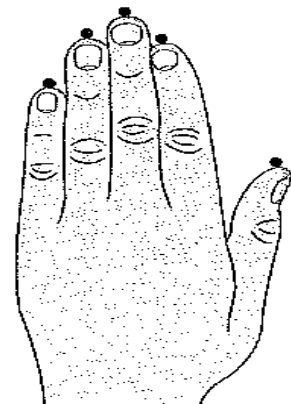
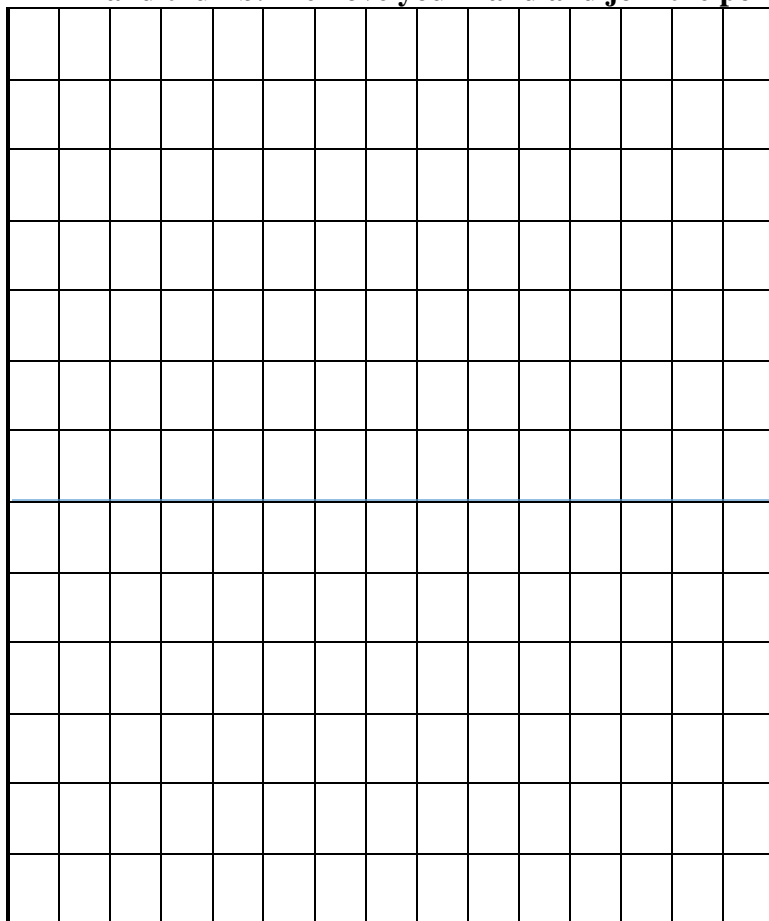


Draw the diagonals and complete the table.

# of sides	# of diagonals	First differences	Second differences
4	2		
5			
6			
7			
8			

ii) Do you believe the pattern you see is linear, quadratic, or neither. Why? Show your proof.

5. Place your hand flat on a piece of grid paper, as shown in the diagram, the tip of your baby finger at the origin. With your pencil, place a dot at the tip of each finger and thumb. Remove your hand and join the points with a smooth curve. (5 marks)



a) What type of curve is shown?

b) What are the coordinates of the vertex of your curve?

c) How can we find the equation of this curve?