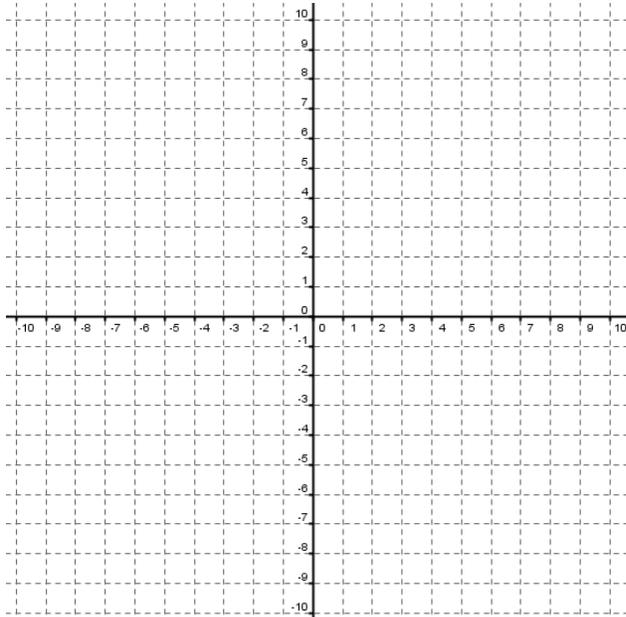


Characteristics of Quadratics

For each of the following quadratic functions,

- complete the tables of values (ToV).
- make a sketch of the quadratic.
- complete the columns in the ToV for the first difference(Δ^1) and second difference(Δ^2).
- answer the questions for each quadratic and the summary questions at the end of the investigation.

I: $y = x^2$

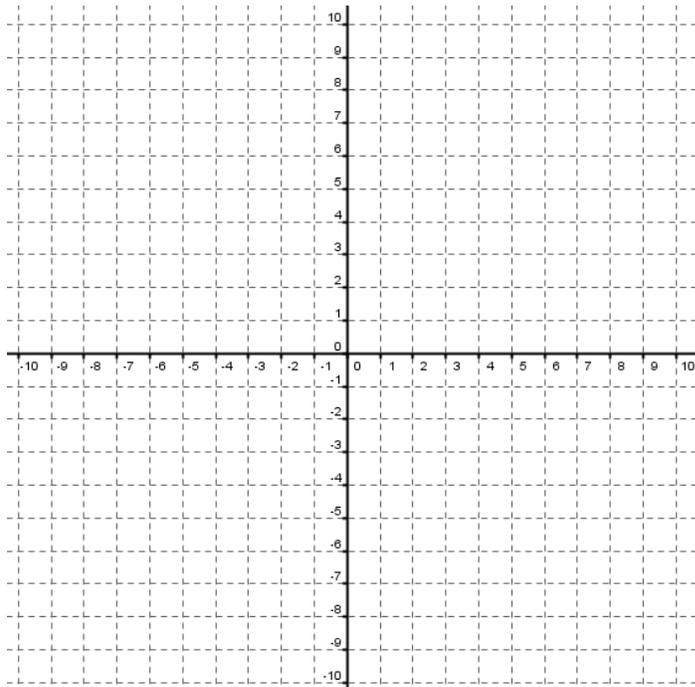


x	y	Δ^1	Δ^2
0			
1			
2			
3			
4			
5			
6			

State the:

- a) direction of opening _____
- b) equation of the Axis of Symmetry (AoS) _____
(The axis of symmetry is the line that divides the graph in equal halves)
- c) y-intercept _____
- d) coordinates of the vertex. _____
(The vertex is the turning point of the graph)
- e) zero(s). _____
(x-intercepts)
- f) maximum or minimum value. _____
- g) Do you notice anything about the 2nd differences?
- h) How would you describe the shape of the curve?

II: $y = x^2 - 6x + 5$

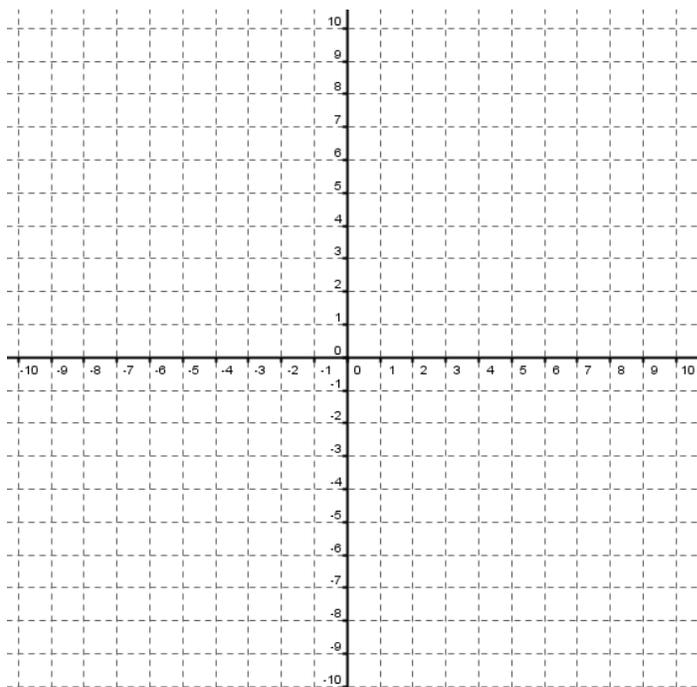


x	y	Δ^1	Δ^2
0			
1			
2			
3			
4			
5			
6			

State the:

- a) direction of opening _____
- b) equation of the Axis of Symmetry (AoS) _____
(The axis of symmetry is the line that divides the graph in equal halves)
- c) y-intercept _____
- d) coordinates of the vertex. _____
(The vertex is the turning point of the graph)
- e) zero(s). _____
(x-intercepts)
- f) maximum or minimum value. _____
- g) Do you notice anything about the 2nd differences?
- h) How would you describe the shape of the curve?

III: $y = -x^2 + 7x + 10$

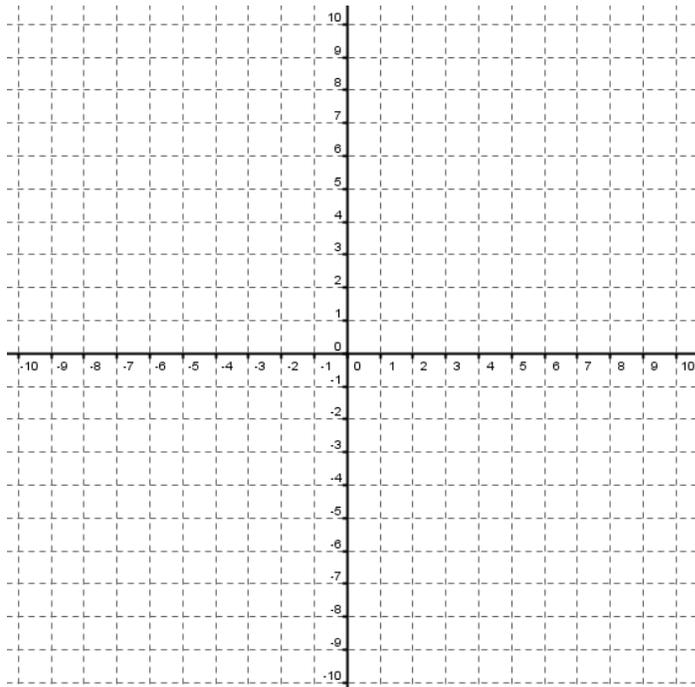


x	y	Δ^1	Δ^2
0			
1			
2			
3			
4			
5			
6			

State the:

- a) direction of opening _____
- b) equation of the Axis of Symmetry (AoS) _____
(The axis of symmetry is the line that divides the graph in equal halves)
- c) y-intercept _____
- d) coordinates of the vertex. _____
(The vertex is the turning point of the graph)
- e) zero(s). _____
(x-intercepts)
- f) maximum or minimum value. _____
- g) Do you notice anything about the 2nd differences?
- h) How would you describe the shape of the curve?

IV: $y = -x^2 - 12x - 9$



x	y	Δ^1	Δ^2
-6			
-5			
-4			
-3			
-2			
-1			
0			

State the:

a) direction of opening

b) equation of the Axis of Symmetry (AoS)
(The axis of symmetry is the line that divides the graph in equal halves)

c) y-intercept

d) coordinates of the vertex.
(The vertex is the turning point of the graph)

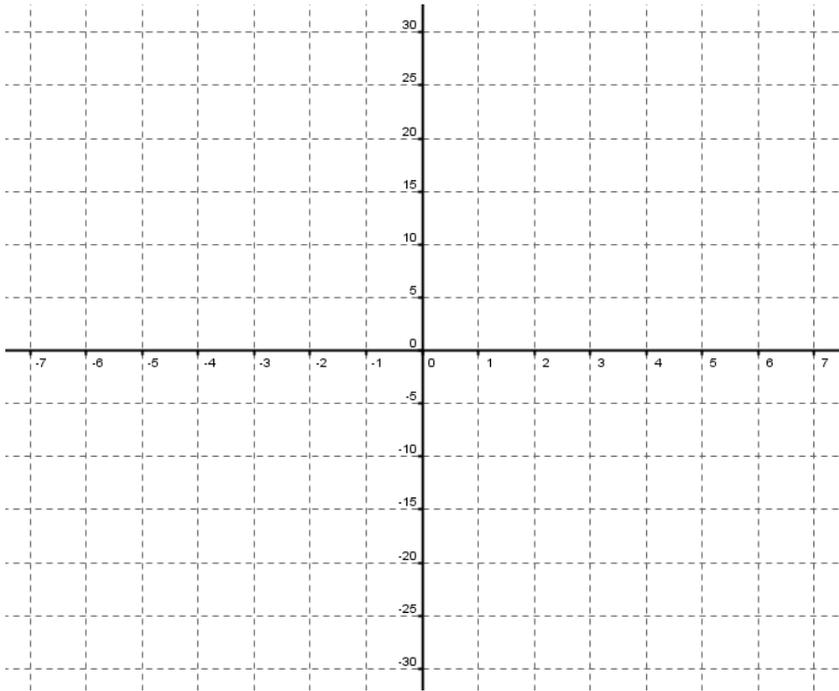
e) zero(s).
(x-intercepts)

f) maximum or minimum value.

g) Do you notice anything about the 2nd differences?

h) How would you describe the shape of the curve?

V: $y = 3x^2 + 24x + 48$



x	y	Δ^1	Δ^2
-7			
-6			
-5			
-4			
-3			
-2			
-1			

State the:

- a) direction of opening _____
- b) equation of the Axis of Symmetry (AoS) _____
(The axis of symmetry is the line that divides the graph in equal halves)
- c) y-intercept _____
- d) coordinates of the vertex. _____
(The vertex is the turning point of the graph)
- e) zero(s). _____
(x-intercepts)
- f) maximum or minimum value. _____
- g) Do you notice anything about the 2nd differences?
- h) How would you describe the shape of the curve?

Characteristics of a Quadratic Function – Summary

- The degree of any quadratic relation ($y = ax^2 + bx + c$, $a \neq 0$) is _____.
- The graph of any quadratic relation is called a _____.
- The maximum or minimum value of a quadratic relation is also called the optimal value.
- The optimal value of any quadratic is the ___ -coordinate of the _____.
- The direction of opening of the graph quadratic relation can be determined in two ways.
 1. _____
 2. _____

If the constant value of the second differences is positive, then the graph opens ____.

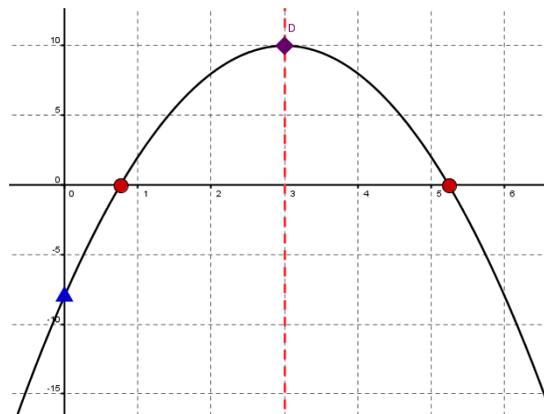
If the constant value of the second differences is negative, then the graph opens ____.

If the value of a in $y = ax^2 + bx + c$ is positive, the graph opens _____.

If the value of a in $y = ax^2 + bx + c$ is negative, the graph opens _____.

- The vertex lies on the **axis of symmetry**. If the coordinates of the vertex are (h, k) , then the equation of the axis of symmetry is _____
- The axis of symmetry is the _____ of the segment joining any two points on the parabola that have the same y -coordinates.
- If the parabola crosses the x -axis, the x -coordinates of these points are called the _____ or **x -intercepts** of the relation, and the _____ is directly above or below the midpoint of the segment joining the zeros.

Zeros at $(x_1, 0)$ and $(x_2, 0)$



- The relationship between the value of a in $y = ax^2 + bx + c$ and the value of the second difference is $a =$ _____.