AChor/MFM1P **Name: _____**

Date: _____

Worksheet 8-1: Quadratic Relations $y = ax^2 + bx + c$ where $a \neq 0$

Quadratic Relations:

A quadratic relation involves a **2nd degree** polynomial that consists of not only an *x*-term and a constant term like a linear relation $y = mx + b$, but it also has an ***x*²- term**.

Note: **The *x*²- term tells that it is a quadratic relation.**

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

1. Which of the following is a quadratic relation?

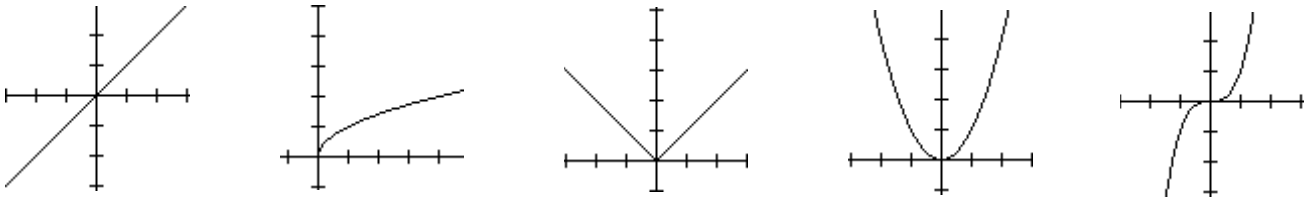
$y = x^2$ $y = 3x$ $y = 2^x$ $y = -x^2 + 7x - 1$

$y = 2x + 4$ $y = x^3 - x^2$ $y = 9x^2 + 3x - 1$ $y = x + x^2$

Parabola: The Graph of a Quadratic Relation

The graph of a quadratic relation is a **U-shaped** curve called a parabola.
The base equation $y = x^2$ gives the basic parabola.

2. Which of the following is a parabola?



Second Differences of a Quadratic Relation are Constant

For linear relations, first differences are constant (first degree equations).
For quadratic relations, second differences are constant (second degree equations).

3. Which of the following table of values represent a quadratic relation?

(a)

x	*y*	
0	3	
1	6	
2	9	
3	12	

(b)

x	*y*	
0	1	
1	6	
2	9	
3	10	

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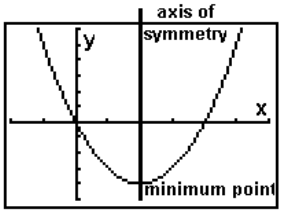
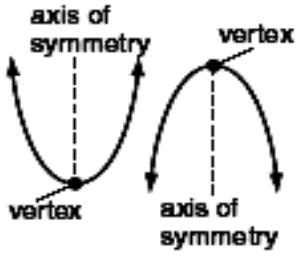
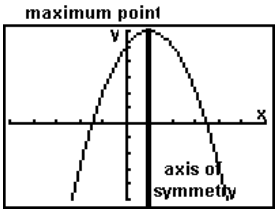
Properties of a Quadratic Relation:

- **Vertex:** A quadratic relation has a maximum or a minimum value at its vertex (turning point).
  When the curve opens upward, the vertex gives the minimum value.
  When the curve opens downward, the vertex gives the maximum value.





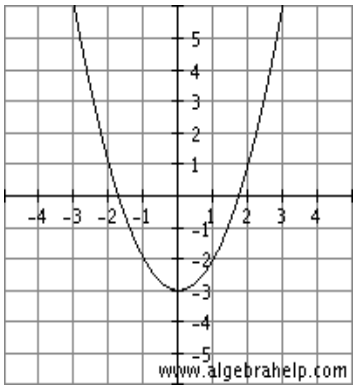


- **Axis of Symmetry:** A quadratic relation is symmetrical about the vertical line that passes through the vertex. This line is called the axis of symmetry.

4. For the following parabolas,

(a) State the ordered pair of the vertex.
(b) Does the curve open upward or downward?
(c) State the maximum or minimum value.
(d) State the equation of the line of symmetry: x = x-coordinate of the vertex.

(i)



(ii)