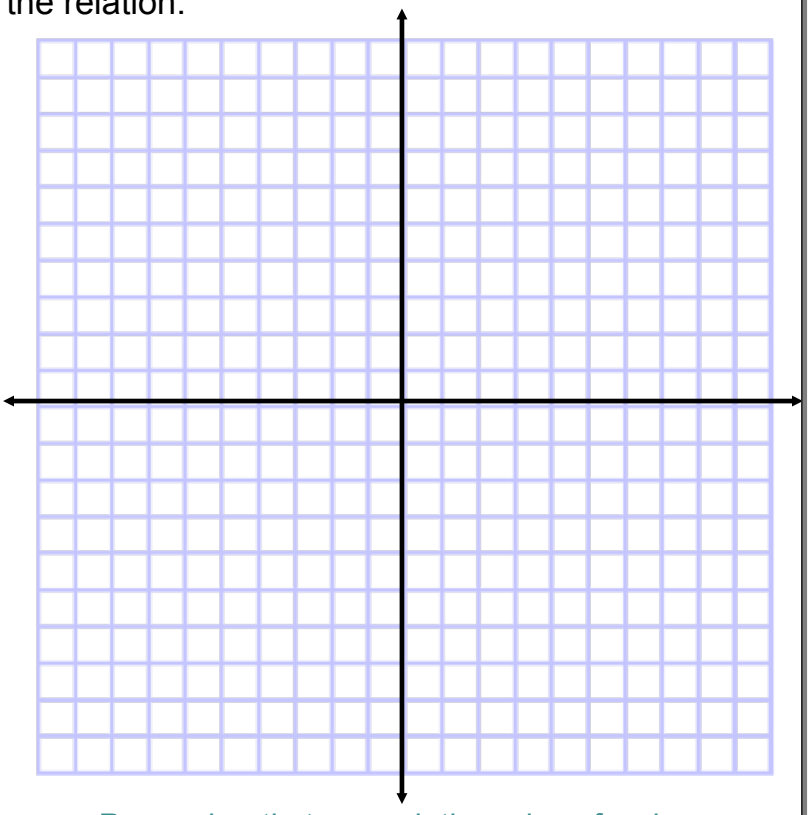
Date: _____

3.2 Properties of Graphs of Quadratic Relations

Create a table of values for the relation $y = (x-1)^2-4$.
Accurately (on a grid) graph the relation.

x	y
-1	0
0	-3
1	
2	
3	



Remember that you sub the value of x given in the table into the equation to fill in the y-values in the table.

1) Vocabulary

Word Bank

Parabola
Zero(s)
Vertex
Optimal value
Axis of symmetry

Important Definitions:

parabola - a symmetric, u - shaped curve that represents a quadratic function

vertex (h,k) - the maximum or minimum point in a parabola; the POI of a parabola and its axis of symmetry

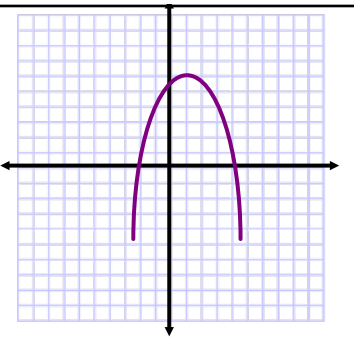
axis of symmetry - the vertical line that splits a parabola into two identical parts; equation is x = h

zeros - the x - intercept(s) of a parabola; there can be none, one, or two

optimal value - the maximum or minimum value; the y-coordinate of the vertex (y=k)

ex/ Examine the parabola shown and determine:

a) the coordinates of the vertex
b) the optimal value
c) the equation of the axis of symmetry
d) the zeros.



2) Determining the Direction of Opening

As we have already discussed, our second differences tell us which way a parabola opens. When they are positive, the parabola will open up. When they are negative, the parabola will open down. The leading coefficient (the number attached to x^2 in the equation) does the same thing (so $y = 2x^2$ opens up, and $y = -2x^2$ opens down).

***When a parabola opens down it has a maximum. When it opens up it has a minimum.**

3) Using Zeros to Find the Axis of Symmetry

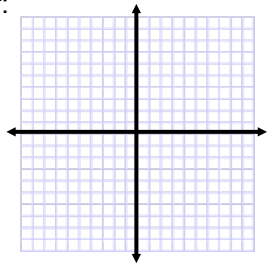
The axis of symmetry is always exactly in the middle of the two zeros. To find it's equation, simply take the x - coordinates of the zeros (or any two points with the same y - coordinates), add them, and then divide by two. What formula is this part of?

ex/ A parabola has zeros at (3, 0) and (7, 0). Write the equation of its axis of symmetry.

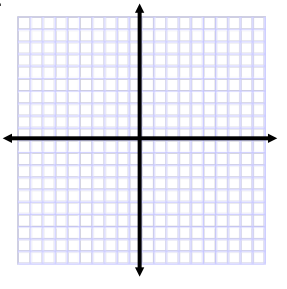
****Remember that the equation of a vertical line has the form x = a!!****

4) Determining the Sign of the Optimal Value

The optimal value (max or min) is positive (above the x - axis) if:



The optimal value is zero (on the x - axis) if:



The optimal value is negative (below the x - axis) if: