QUADRATIC RELATIONS: INTRO
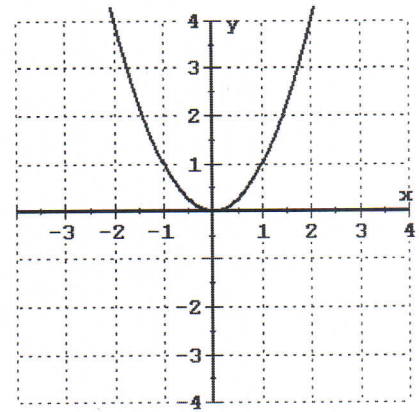
Quadratic relation:

- In graph form, it is a __U-shaped curve__ called a __Parabola__

- It is represented in the form __$y = Ax^2 + Bx + C$__
  For example: __$3x^2 + 2x + 1$__

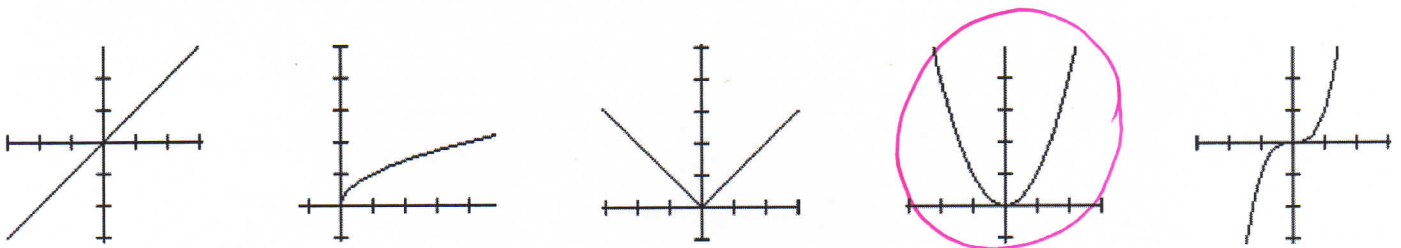- There is always an __x^2__ term in a quadratic relation.

Which of the following is a quadratic relation?

$$\boxed{y = x^2}$$ $$y = 3x$$ $$y = 2^x$$ $$\boxed{y = -x^2 + 7x - 1}$$

$$y = 2x + 4$$ $$\boxed{\cancel{y = x^3 - x^2}}$$ $$\boxed{y = 9x^2 + 3x - 1}$$ $$\boxed{y = x + x^2}$$

Highest exponent is 2

Which of the following is a parabola?

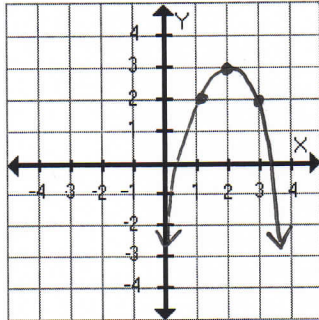**Where else may you find parabolas in the world?**

QUADRATIC RELATIONS: CHARACTERISTICS

Date: _Notes_

Vertex (Minimum or Maximum):

- A quadratic has a ___maximum or minimum___ value at its vertex (turning point).
- Vertex can be at the "top of a mountain" (__max point__) when the curve opens _down_.
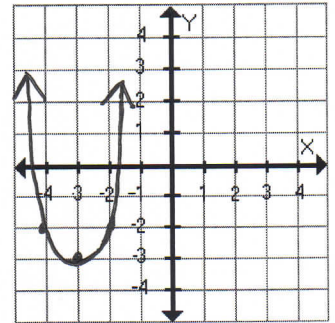- Vertex can be at the "bottom of the valley" (__min point__) when the curve opens _up_.

Vertex: __(2,3)__

Max/Min Value:

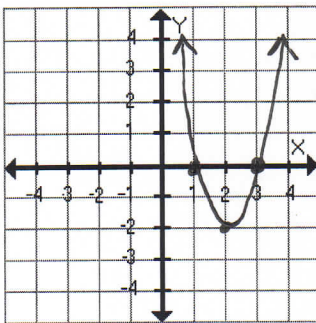__max value:__
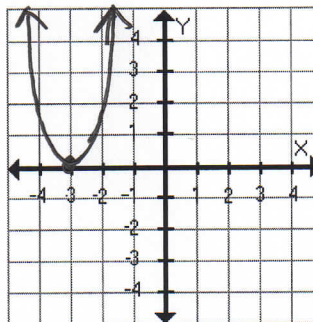3

Vertex: __(-3,-3)__

Max/Min Value:
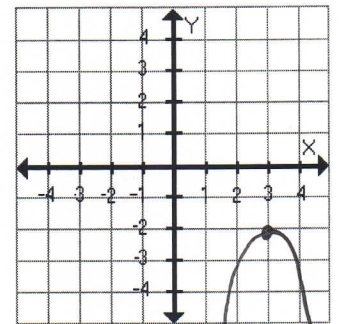
__min value :__
-3

X-Intercepts (The Zeroes)

- This is where the parabola __crosses the x-axis__.
- There may be __zero, 1, or 2 zeroes.__

x-intercept(s) __(1,0)__
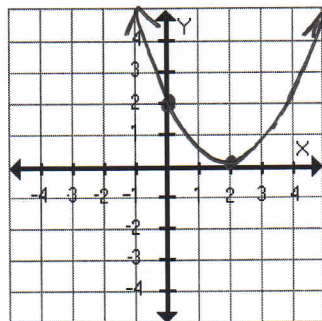__(3,0)__

x-intercept(s) __(-3,0)__
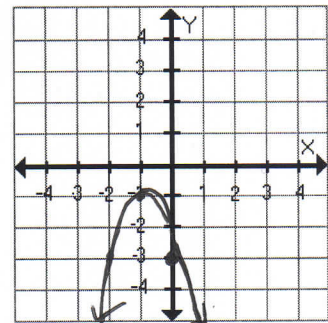
x-intercept(s) __None__

Y-Intercept

- This is where the parabola __crosses the y-axis__.
- At the y-intercept, __x is always zero__.

y-intercept __(0,2)__

y-intercept __(0,-3)__
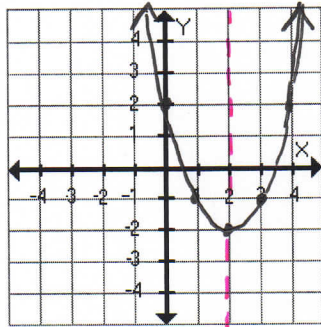
QUADRATIC RELATIONS: CHARACTERISTICS

Date: _____

Axis of Symmetry:

- A quadratic relation is ___*symmetrical*___ which means a mirror image is created. This is called the ___*axis of symmetry*___.

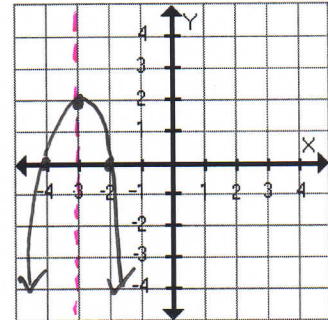- The axis of symmetry always passes through the ___*vertex*___.

- It is expressed as ___*x =*___.

Axis of Symmetry:
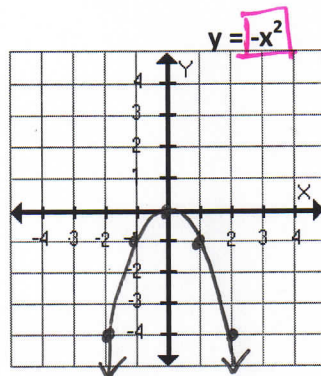
___*x = 2*___

Axis of Symmetry:

___*x = -3*___

Direction of Opening:

- The sign in front of the ___x^2___ term determines whether the curve will ___*up or down*___.

- If negative ($-x^2$), curve will open ___*down*___. If positive (x^2), curve will open ___*up*___.
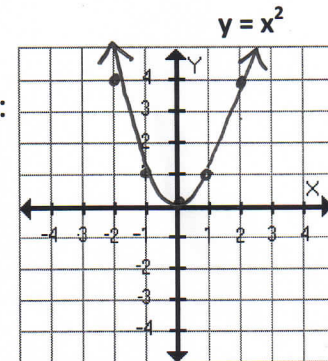
$y = \boxed{-x^2}$

Direction of Opening:

___*down*___

$y = x^2$

Direction of Opening:

___*up*___

EXAMPLE: For the following parabola...

1. Draw and state the vertex as (x,y).   *(3, 1)*

2. State the maximum/minimum value.   *max value = 1*

3. Draw and state the zeroes (x-intercepts).   *(2, 0)*   *(4, 0)*

4. Draw and state the y-intercept   *(0, -8)*

5. State the direction of the opening of the curve.   *down*

6. Draw axis of symmetry and state its equation.
   x = 3

vertex (3, 1)
zero   *zero*
y-int