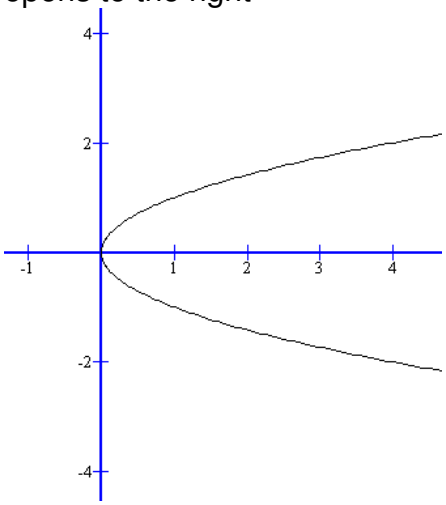
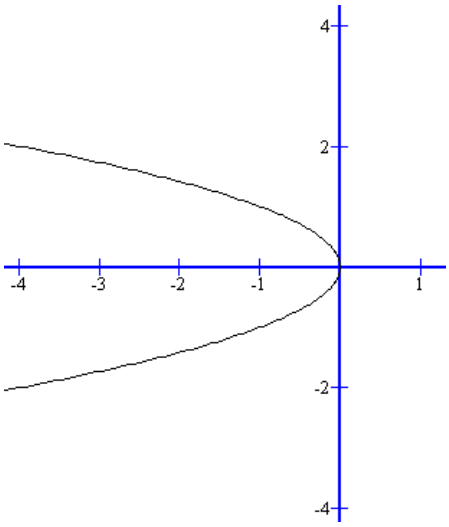
Horizontal Parabolas

A horizontal parabola is the same as a vertical parabola except that it either opens to the right



Or it opens to the left:



The equation of the basic horizontal parabola is $y^2 = x$.

This is exactly the same as the vertical parabola's equation except that the x's and y's will be switched around.

The y variables will have highest degree of 2 and the x variables will have highest degree of 1.

Note: The vertical parabola **is** a function, but the horizontal parabola is **not.**

The parabola opens to the **left** if the y squared term is **negative.**

The parabola opens to the **right** if the y squared term is **positive.**

If the parabola opens to the left, the vertex is the rightmost point.
If the parabola opens to the right, the vertex is the leftmost point.

The vertex for the equation $x = ay^2 + by + c$ is

$y = -\frac{b}{2a}$. Substituting this back into the equation, we can find the corresponding x coordinate.

Example:

What is the orientation and vertex of $x = 3y^2 + 2y$

The y squared term is positive, so the parabola is oriented to open to the right.

The vertex is located at $y = -\frac{b}{2a} = -\frac{2}{6} = -\frac{1}{3}$

Substituting this into the equation, we get the x coordinate as:

$$x = 3\left(-\frac{1}{3}\right)^2 + 2\left(-\frac{1}{3}\right) = -\frac{1}{3}$$

So, the vertex is at $\left(-\frac{1}{3}, -\frac{1}{3}\right)$

Find the vertex and orientation of the following horizontal parabolas:

1. $x = 4y^2 - 1$

2. $x = 3y^2$

3. $x = -2y^2 - 2$

4. $x = -y^2 + y + 3$

5. $x = -2y^2 + 4y - 1$

6. $x = y^2 + 5y + 1$

7. $x = (y - 3)^2$

8. $x = (4 - y)^2$

9. $x = (y - 1)^2 + 4$

10. $x = -12y^2 + 24y + 1$