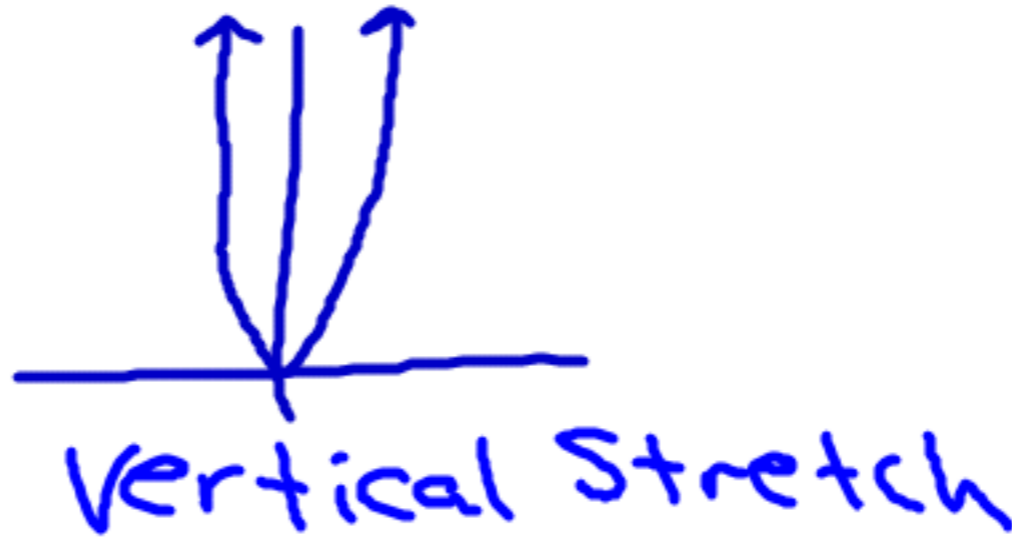
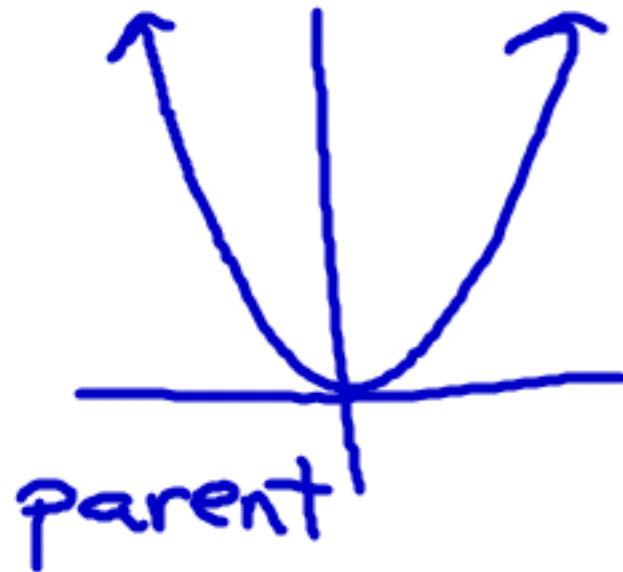


5.3 Stretches

Two types of stretches

1) Vertical Stretch - makes the parent graph thinner



2) Horizontal Stretch - makes the parent graph wider or fatter



Multiplication is the only operation that affects stretching.

The number that stretches the graph is called the scale factor.

If the scale factor is bigger than 1, then the graph stretches vertically or becomes thinner.

If the scale factor is smaller than 1, then the graph stretches horizontally or becomes wider or fatter.

To graph a stretch,

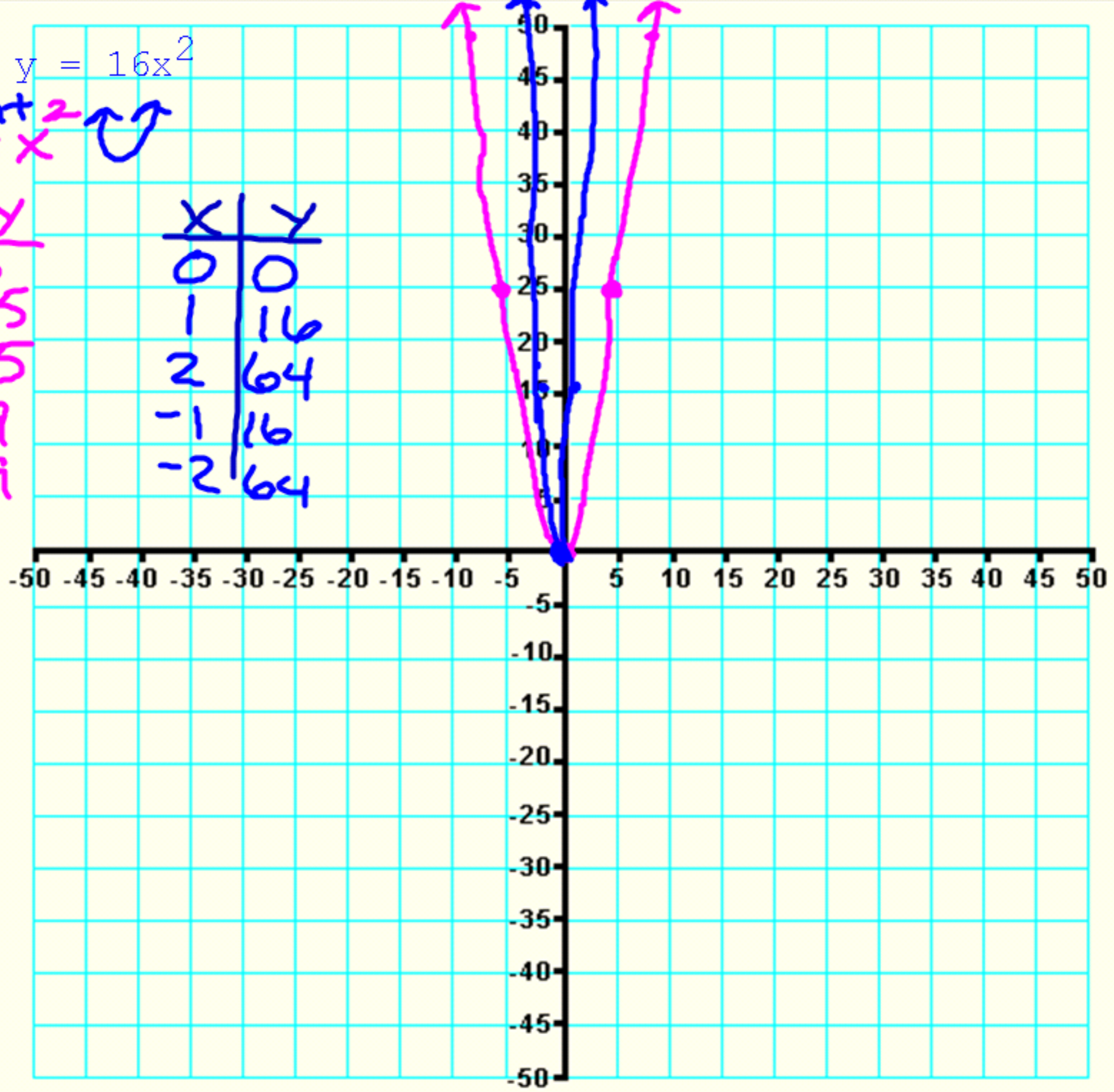
1. Identify the parent function to get a general idea of the shape of your graph.
2. Identify the scale factor to know which direction your graph will stretch.

Graph $y = 16x^2$

parent $y = x^2$ ↗ ↘

| x | y |
|---|----|
| 0 | 0 |
| 5 | 25 |
| 7 | 49 |
| 9 | 81 |

| x | y |
|----|----|
| 0 | 0 |
| 1 | 16 |
| 2 | 64 |
| -1 | 16 |
| -2 | 64 |



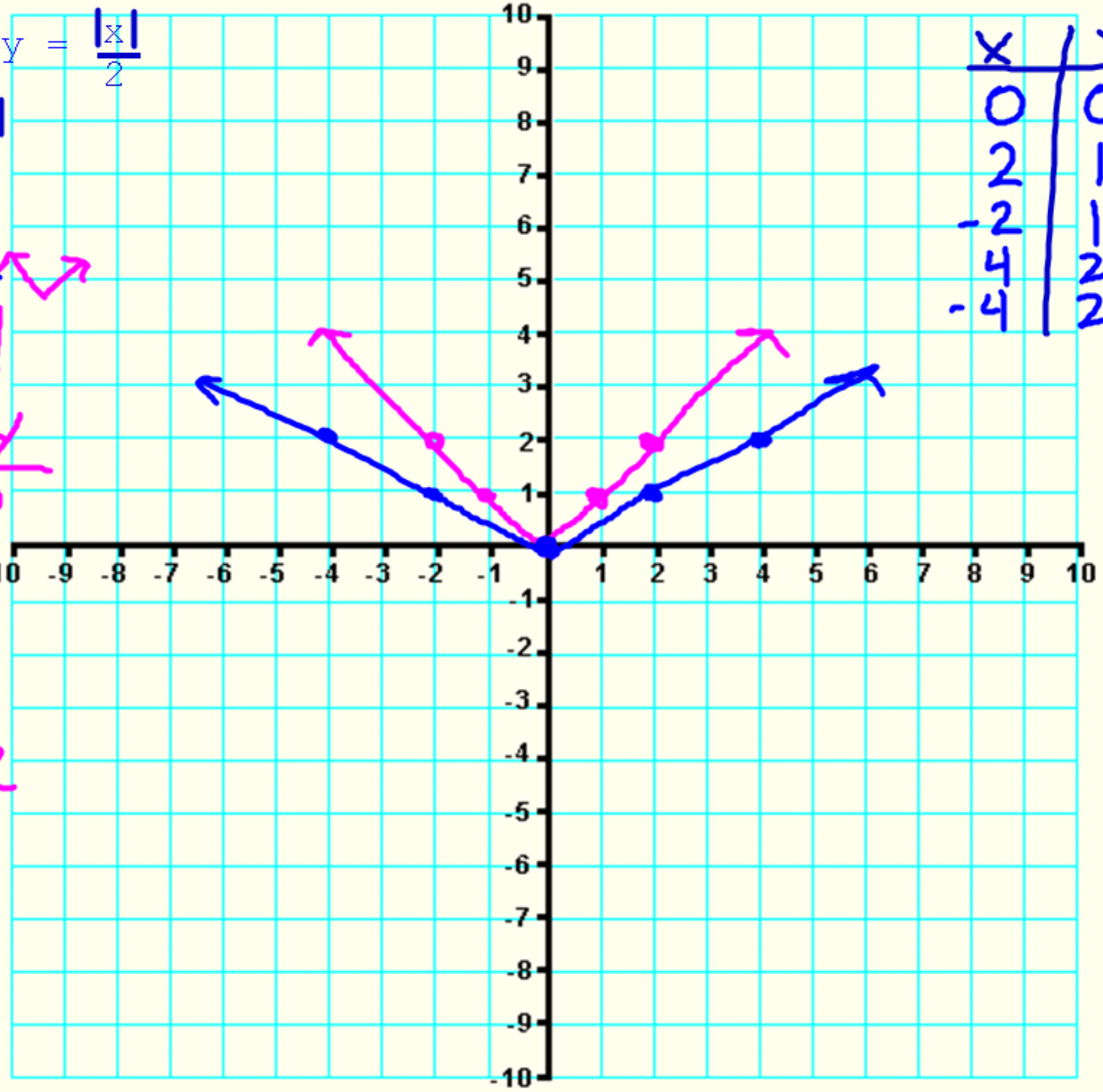
Graph $y = \frac{|x|}{2}$

$y = \frac{1}{2}|x|$

parent $y = |x|$

| x | y |
|----|----|
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |
| -1 | -1 |
| -2 | -2 |

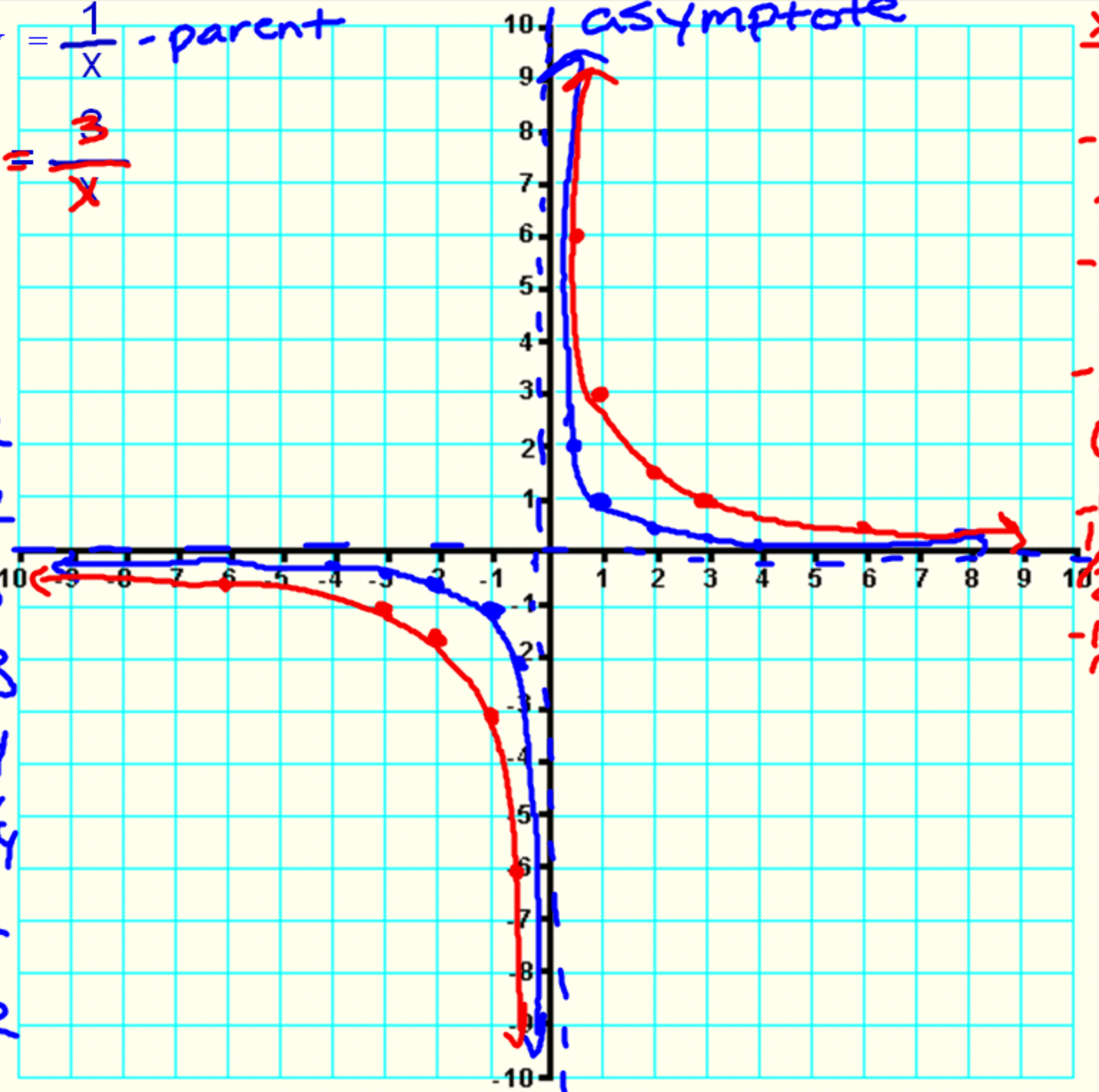
| x | y |
|----|----|
| 0 | 0 |
| 2 | 1 |
| -2 | -1 |
| 4 | 2 |
| -4 | -2 |



Graph $y = \frac{1}{x}$ - parent

Graph $y = \frac{3}{x}$

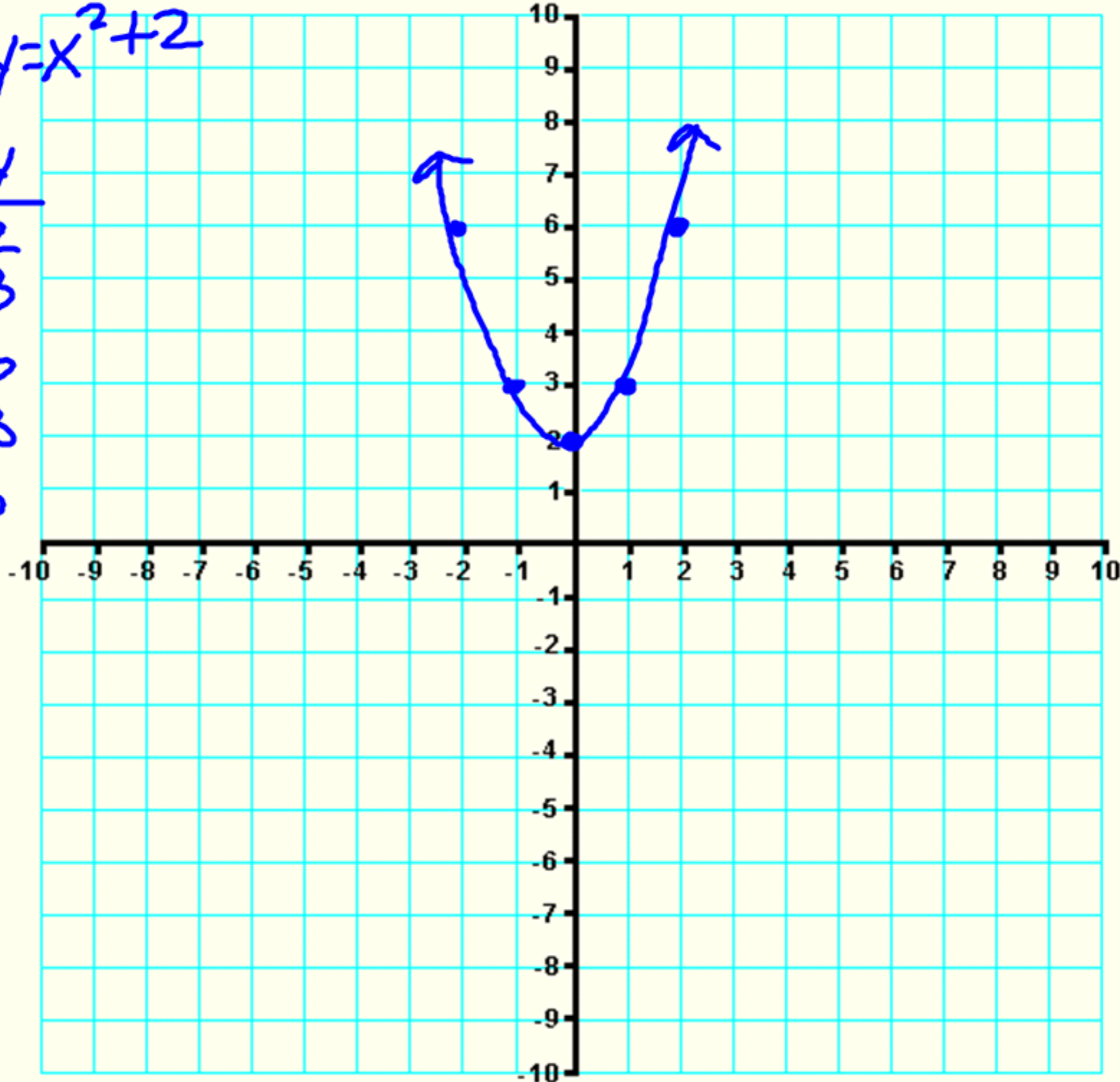
| X | Y |
|-----|-------|
| 1 | 1 |
| 2 | 1/2 |
| 3 | 1/3 |
| 4 | 1/4 |
| 5 | 1/5 |
| 6 | 1/6 |
| 7 | 1/7 |
| 8 | 1/8 |
| 9 | 1/9 |
| 10 | 1/10 |
| -1 | -1 |
| -2 | -1/2 |
| -3 | -1/3 |
| -4 | -1/4 |
| -5 | -1/5 |
| -6 | -1/6 |
| -7 | -1/7 |
| -8 | -1/8 |
| -9 | -1/9 |
| -10 | -1/10 |



| X | Y |
|------|------|
| 1 | 3 |
| -1 | -3 |
| 2 | 1.5 |
| -2 | -1.5 |
| 3 | 1 |
| -3 | -1 |
| 6 | 1/2 |
| -6 | -1/2 |
| 1/2 | 6 |
| -1/2 | -6 |

⑥ $y = x^2 + 2$

| X | Y |
|----|---|
| 0 | 2 |
| 1 | 3 |
| 2 | 6 |
| -1 | 3 |
| -2 | 6 |



$$y = \cancel{x^2} x^2$$

$$- y = x^2$$

$$y = \cancel{\frac{1}{2}} x^2$$

$$- y = x^2$$

$$y = \cancel{1} x^3$$

$$- y = x^3$$

$$y = \cancel{\sqrt{x}} \sqrt{x}$$

$$- y = \sqrt{x}$$

$$y = \cancel{|x|} |x|$$

$$- y = |x|$$

$$y = \cancel{|x|} |x|$$

$$- y = |x|$$