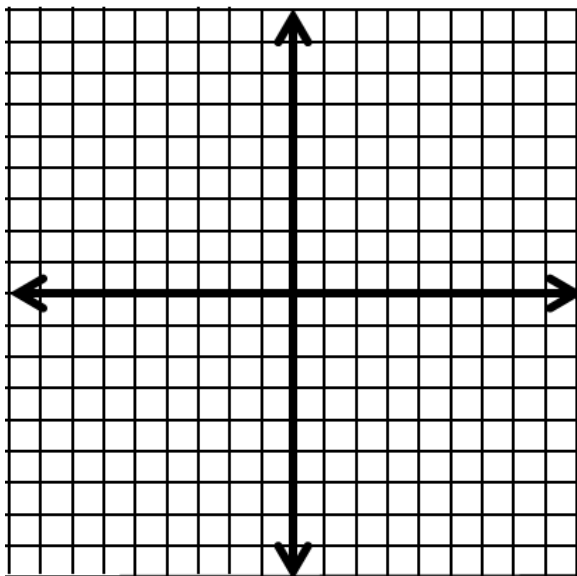# Graphing Quadratics

What does the **Parent Quadratic Function** look like?

$$y = x^2$$
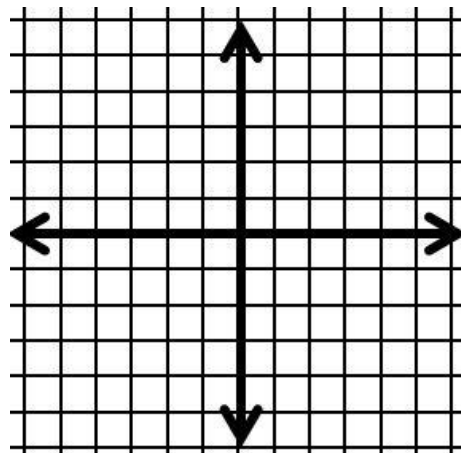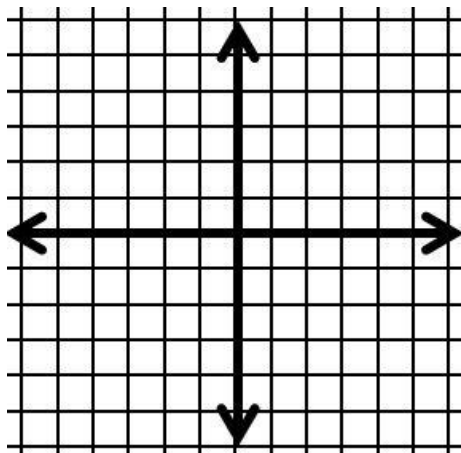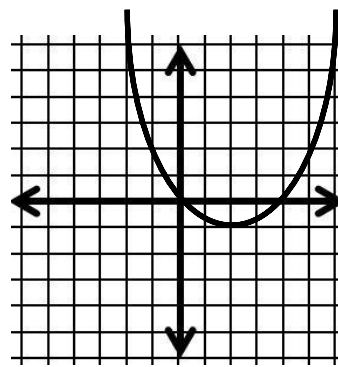
parabola:

axis of symmetry:

vertex:

3 Solve $x^2 + 7 = 4x$ by graphing.
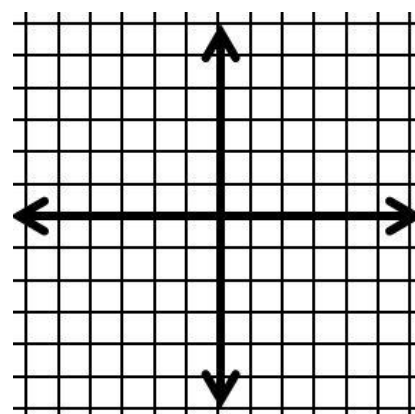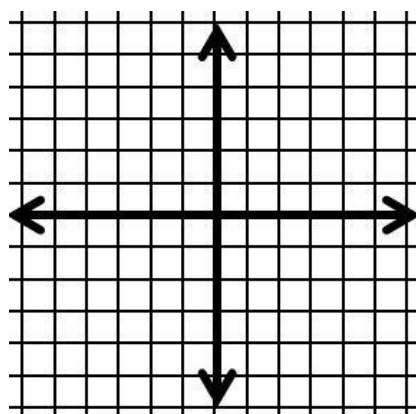
4 Find the zeros of $f(x) = 4x^2 - 4x + 1$

Solve Quadratics by Graphing

How can a graph be used to
identify the solutions of a
quadratic equation?

1 Solve $x^2 + 5x = -6$ by graphing.   **2** Solve $-x^2 + 2x = 1$ by graphing.
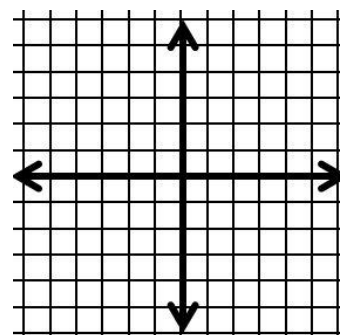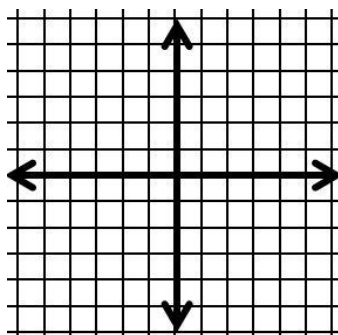
Graph the equations below. Then state the domain and range.

1 $y = x^2 + 2$ **2** $y = x^2 - 2$ **3** $y = \frac{1}{2}x^2$ **4** $y = -x^2$

Graph $y = ax^2 + c$

How do you graph a quadratic equation in **standard form**?

$$y = ax^2 + bx + c$$

Step 1:
Find the axis of symmetry.

Step 2:
Find the vertex.

Step 3:
Make a table.

❶ Graph $y = x^2 - 2x - 3$

❸ Graph $y = 2x^2 - 8x + 6$

❹ Graph $y = \frac{1}{2}x^2 + 2x + 3$

Graph $y = ax^2 + bx + c$

Graphing Quadratics

What does the **Parent Quadratic Function** look like?

$$y = x^2$$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

parabola:
"U" Shape

axis of symmetry:
the line that seperates the parabola into two symmetric parts

vertex:
The lowest (or highest) point on the parabola

---

❸ Solve $x^2 + 7 = 4x$ by graphing.

$$x^2 - 4x + 7 = 0$$

Step 1: $x = \frac{-b}{2a} = \frac{4}{2(1)} = \frac{4}{2} = 2$

Step 2: $2^2 - 4(2) + 7$
$4 - 8 + 7 = 3$

Step 3:

x	y
0	7
1	4
2	3
3	4
4	7

*We discussed the fact that you could actually stop graphing once you found the vertex. It is above the x-axis and since the leading coefficient is positive the parabola opens up, therefore there will be no solutions.

❹ Find the zeros of $f(x) = 4x^2 - 4x + 1$

Step 1: $x = \frac{-b}{2a} = \frac{4}{2(4)} = \frac{4}{8} = \frac{1}{2}$

Step 2: $4(\frac{1}{2})^2 - 4(\frac{1}{2}) + 1 =$
$1 - 2 + 1 = 0$

Step 3:

x	y
-1/2	4
0	1
½	0
1	1
1 ½	

Solve Quadratics by Graphing

How can a graph be used to identify the solutions of a quadratic equation?

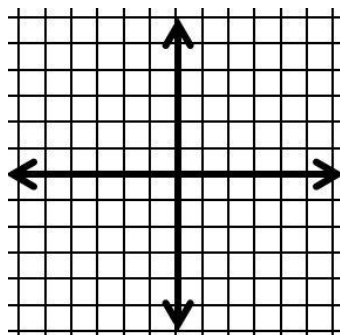**❶ Solve $x^2 + 5x = -6$ by graphing.**

$x^2 + 5x + 6 = 0$

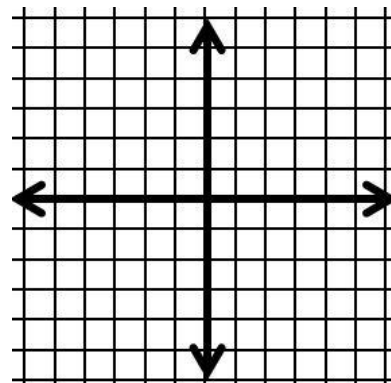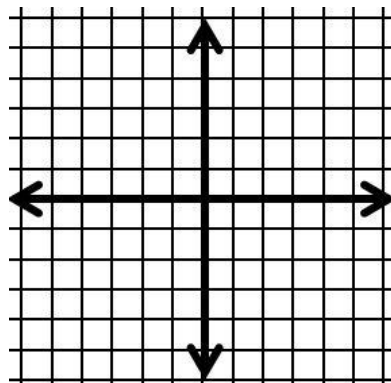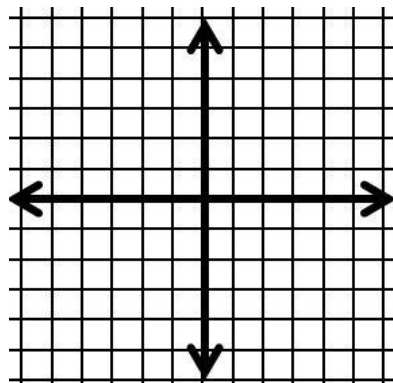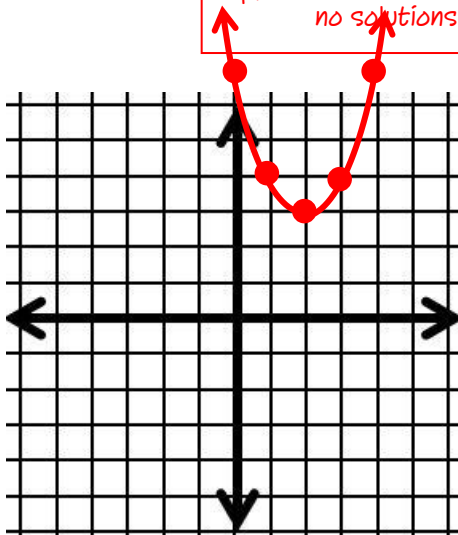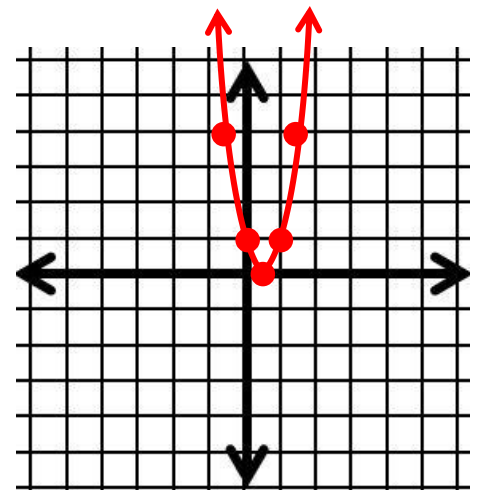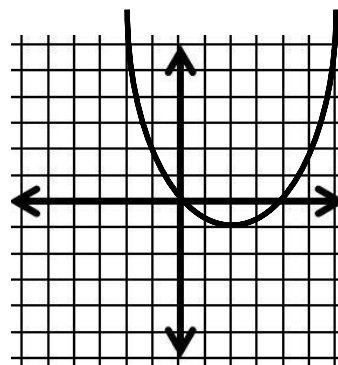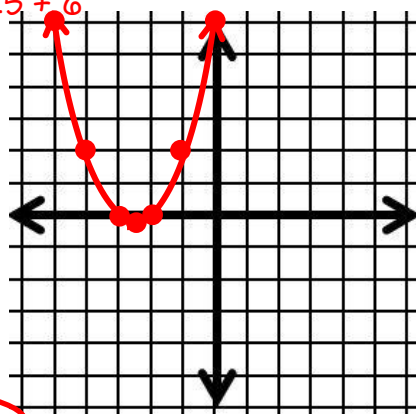Step 1: $x = \frac{-b}{2a} = \frac{-5}{2(1)} = \frac{-5}{2} = -2.5$

Step 2: $(-2.5)^2 + 5(-2.5) + 6$
$= 6.25 - 12.5 + 6$
$= -0.25$

Step 3:

x	y
-4	2
-3	0
-2.5	-0.25
-2	0
-1	2

Solutions: -3, -2

❷ Solve $-x^2 + 2x = 1$ by graphing.
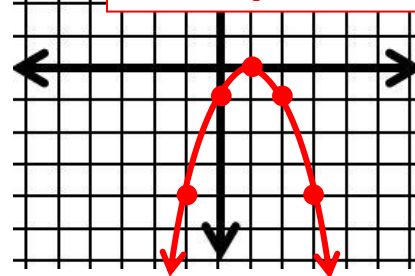
$-x^2 + 2x - 1 = 0$

Step 1: $x = \frac{-b}{2a} = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$

Step 2: $-(1)^2 + 2(1) - 1$
$= -1 + 2 - 1$
$= 0$

*We discussed the fact that you could actually stop graphing once you found the vertex. It is right on the x-axis therefore that will be the only solution.
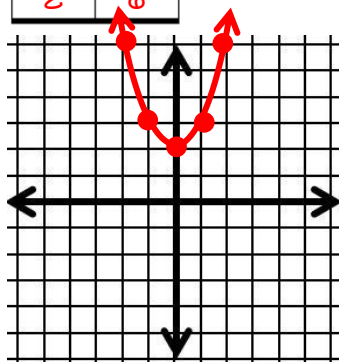
Step 3:

x	y
-1	-4
0	-1
1	0
2	-1
3	-4

Solution: 1

Graph the equations below. Then state the domain and range.

❶ $y = x^2 + 2$

x	y
-2	6
-1	3
0	2
1	3
2	6

Domain: All real #s
Range: $y \geq 2$

❷ $y = x^2 - 2$

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

Domain: All real #s
Range: $y \geq -2$

❸ $y = \frac{1}{2}x^2$

x	y
-2	2
-1	½
0	0
1	½
2	2

Domain: All real #s
Range: $y \geq 0$

❹ $y = -x^2$

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

Domain: All real #s
Range: $y \leq 0$

Graph $y = ax^2 + c$

How do you graph a quadratic equation in **standard form**?

$$y = ax^2 + bx + c$$

Step 1:
Find the axis of symmetry.
$$X = \frac{-b}{2a}$$

Step 2:
Find the vertex.
Sub in 'x' (from step 1) to the original equation to get 'y' (x,y).

Step 3:
Make a table.
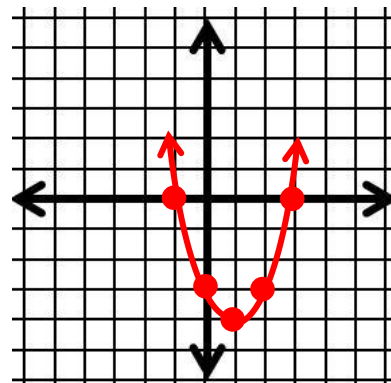Choose at least two points to the left and right of the axis of symmetry.

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❶ Graph $y = x^2 - 2x - 3$

Step 1: $x = \frac{-b}{2a} = \frac{2}{2(1)} = \frac{2}{2} = 1$

Step 2: $(1)^2 - 2(1) - 3$
$= 1 - 2 - 3$
$= -4$

Step 3:

x	y
-1	0
0	-3
1	-4
2	-3
3	0

---

❸ Graph $y = 2x^2 - 8x + 6$

Step 1: $x = \frac{-b}{2a} = \frac{8}{2(2)} = \frac{8}{4} = 2$

Step 2: $2(2)^2 - 8(2) + 6$
$= 8 - 16 + 6$
$= -2$

Step 3:

x	y
0	6
1	0
2	-2
3	0
4	6

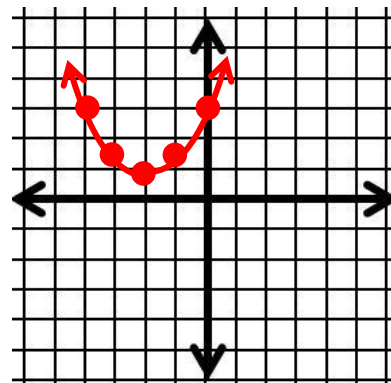
❹ Graph $y = \frac{1}{2}x^2 + 2x + 3$

Step 1: $x = \frac{-b}{2a} = \frac{-2}{2(\frac{1}{2})} = \frac{-2}{1} = -2$

Step 2: $\frac{1}{2}(-2)^2 + 2(-2) + 3$
$= 2 - 4 + 3$
$= 1$

Step 3:

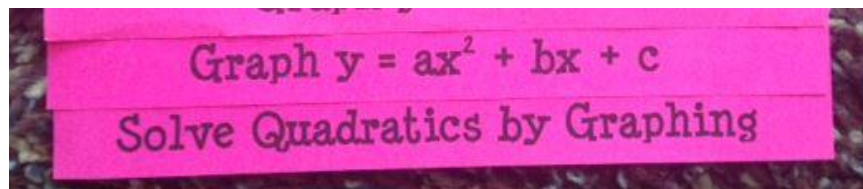| x	y
-4	3
-3	1.5
-2	1
-1	1.5
0	3

Graph $y = ax^2 + bx + c$

Directions:

Step 1:
Print the following pages front to back (flip along the short edge) so that the information is facing in opposite directions.
Pages 1&2 and 3&4

Step 2:
Line up the pages that say "Solve Quadratic Equations by Graphing" and "Graph $y = ax^2 + bx + c$" at the bottom of each page, as shown below.

Step 3:
Fold over the top half so that "Graph $y = ax^2 + bx + c$" is just above "Graph $y = ax^2 + bx + c$" and the title is at the very top. Secure with a few staples.

The final product should look like this: