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

$0=x^2-2x+1$

$a=x$ $\quad 0=(x-1)^2$

$b=1$

$2ab=2\cdot x\cdot -1=-2x$

$0=(x-1)^2$

$0=(x-1)(x-1)$

$x-1=0 \qquad x-1=0$

$+1 \quad +1 \qquad +1 \quad +1$

$\boxed{x=1} \qquad \boxed{x=1}$

8. $5h^2+2h+5=7$

$-7 \quad -7$

$5h^2+2h-2=0$

$\boxed{\text{not factorable}}$

$+ \quad -$

$5\cdot -2=-10$

$+1 \quad -10 \quad -9$

$-1 \quad +10 \quad 9$

$+2 \quad -5 \quad -3$

$-2 \quad +5 \quad 3$

10. $y=\sqrt{4x^2}-\sqrt{49}$ $\quad a^2-b^2=(a+b)(a-b)$

$a=2x$ $\quad (2x+7)(2x-7)=0$

$b=7$ $\quad 2x+7=0 \quad 2x-7=0$

$\sqrt{18}$

# 7-5

## Square Root Property

## Completing the Square

Objective: I can solve quadratics using square root property

I can put a quadratic into vertex form by completing the square

---

### Square Root Property

$\sqrt{x^2} = \sqrt{\#^2}$

$x = \pm \#$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$\sqrt{9}$: $3 \quad 3$

$\sqrt{9}$: $-3 \quad -3$

$\sqrt[2]{3 \cdot 3} = 3$

$\sqrt{-3 \cdot -3} = -3$

Can you use the square root property?

| | | |
|---|---|---|
| $x^2 = 5$ | $\cancel{3x^2 = x - 5}$ | $x^2 - 12 = 0$ |
| $\cancel{x^2 - x = 3}$ | $3x^2 = 18$ | $\cancel{x^2 - 2x + 1 = 0}$ |

$x^2$ #

$x^2 - x + 1 = 0$

$+x - 1 \quad +x - 1$

$\sqrt{x^2} = \sqrt{x+1}$

$x = \sqrt{x+1}$

Solve using the square root property

$$p^2 - 9 = 0$$
$$+9 \quad +9$$
$$\sqrt{p^{\cancel{2}}} = \sqrt{9}$$
$$\boxed{p = \pm 3}$$

$$x - 9 = 0$$
$$+9 \quad +9$$

You Try

$$\frac{3\cancel{b}^2}{3} = \frac{75}{3}$$
$$\sqrt{b^{\cancel{2}}} = \sqrt{25}$$
$$\boxed{b = \pm 5}$$

Solve using the square root property

$$y^2 - 14 = 2$$

You Try

$$3q^2 - 36 = 0$$

$$+36 \quad +36$$

$$\frac{3q^2}{3} = \frac{36}{3}$$

$$\sqrt{q^2} = \sqrt{12}$$

3 4

2 2

$$q = \sqrt{3 \cdot 2 \cdot 2}$$

$$\sqrt{3 \cdot -2 \cdot -2}$$

$$\boxed{q = \pm 2\sqrt{3}}$$

Solve using the square root property

$$(x-2)^2 = 25$$

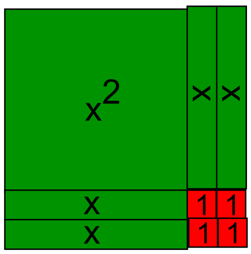
You Try

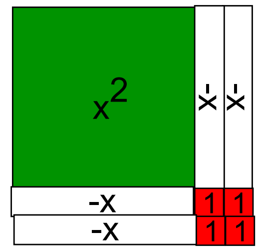
$$(q-5)^2 - 21 = 4$$

If we could put a quadratic into that form, that could give us another way to solve!

## Perfect Square Binomials

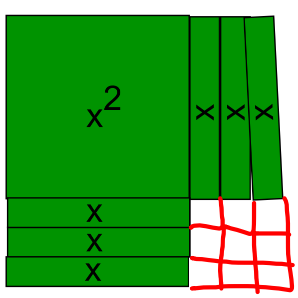
$x^2 + 4x + 4 = (x + 2)^2$ $\qquad$ $x^2 - 4x + 4 = (x - 2)^2$




## What does it mean to "complete the square?"

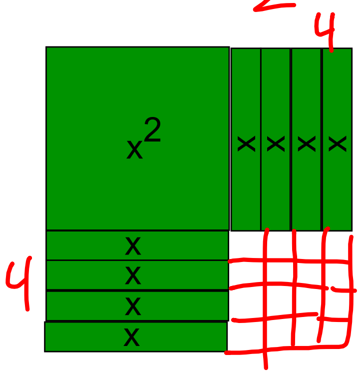
$x^2 + 6x + \underline{\ 9\ } = (x+3)^2$




manipulative

You try! Complete the square.

$$x^2 + \frac{8x}{2} + \underline{16} = (x+4)^2$$



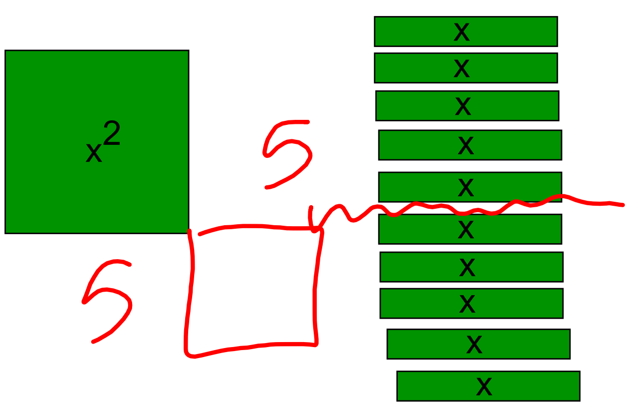

$$\frac{8}{2} = 4^2 = 16$$

$4 \cdot 4$

manipulative

You try! Complete the square.

$$x^2 + 10x + \underline{25} = (x+5)^2$$




$$\frac{10}{2} = 5^2$$

manipulative

# Have you found a pattern?

$x^2 + 6x + \underline{\ 9\ }$ $\left(\frac{6}{2}\right)^2$

$x^2 + 8x + \underline{\ 16\ }$ $\left(\frac{8}{2}\right)^2$

$x^2 + 10x + \underline{\ 25\ }$ $\left(\frac{10}{2}\right)^2$

$ax^2+bx+c$

complete the $\square$

$$\left(\frac{b}{2}\right)^2$$

Determine the constant that must be added to the expression to make it a perfect square trinomial. Then factor the expression.

$$p^2 + 14p + \underline{49} = (p+7)^2$$

manipulative

You Try

$w^2 + 12w + \underline{36} = (w+6)^2 \quad \left(\frac{b}{2}\right)^2$

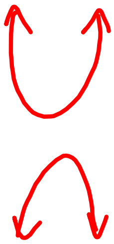
$\frac{12}{2} = 6^2$

$w^2 + 9w$

Solve by completing the square.

$f(x) = b^2 + 2b - 8$

REMINDER: Graphing Form (Vertex Form)



$$\boxed{f(x) = a(x-h)^{n} + k}$$

2

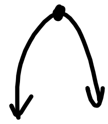
Steep

− flip

L or R

x's lie

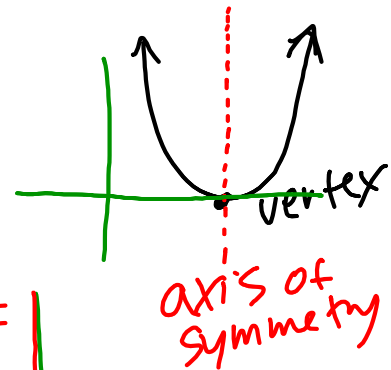
U or D



ex. $2(x-1)^2+3$

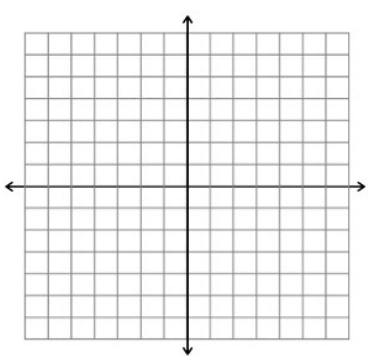
Vertex: $(1,3)$

axis of symmetry: $x=1$

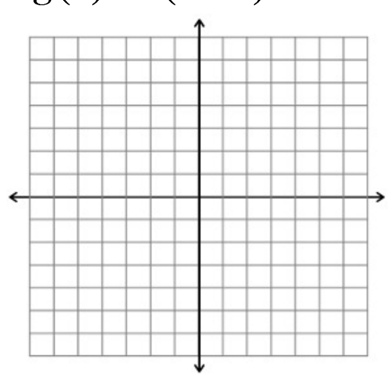



Find the vertex and graph

$f(x) = (x-2)^2 - 1$



$g(x) = 2(x+4)^2 - 2$



Axis of Symmetry: x = +h $f(x) = a(x-h)^n + k$

or

x = -b/2a $f(x) = ax^2 + bx + c$

Write the quadratic equation in vertex form:

$f(x) = x^2 + 4x + 3$

$\frac{4}{2} = 2^2 = 4$

$f(x) = (x^2 + 4x + \underline{4}) - \underline{4} + 3$

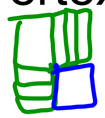
$\boxed{f(x) = (x+2)^2 - 1}$

vertex: (-2, -1)
a of symm:
x = -2

Vertex:
Axis of Symmetry:
Transformations:

Write the quadratic equation in vertex form:

$$f(x) = x^2 - 6x - 2$$



$\frac{-6}{2} = (-3)^2$

$$f(x) = (x^2 - 6x + \underline{9}) - \underline{9} - 2$$

$$\boxed{f(x) = (x-3)^2 - 11}$$

vertex: (3, -11)
a of symm:
x = 3

Vertex:
Axis of Symmetry:
Transformations:

Write the quadratic equation in vertex form:

$$f(x) = x^2 + 6x - 1$$

Vertex:
Axis of Symmetry:
Transformations:

Write the quadratic equation in vertex form:

$$g(x) = x^2 + 5x + 2$$

Vertex:
Axis of Symmetry:
Transformations:

Write the quadratic equation in vertex form:

$$f(x) = 2x^2 + 4x + 6$$

$\frac{2}{2} = 1^2$

$f(x) = (\frac{2x^2}{2} + \frac{4x}{2} + \_\_\_) - \_\_\_ + 6$

$f(x) = 2(x^2 + 2x + \underline{1}) - \underline{2} + 6$

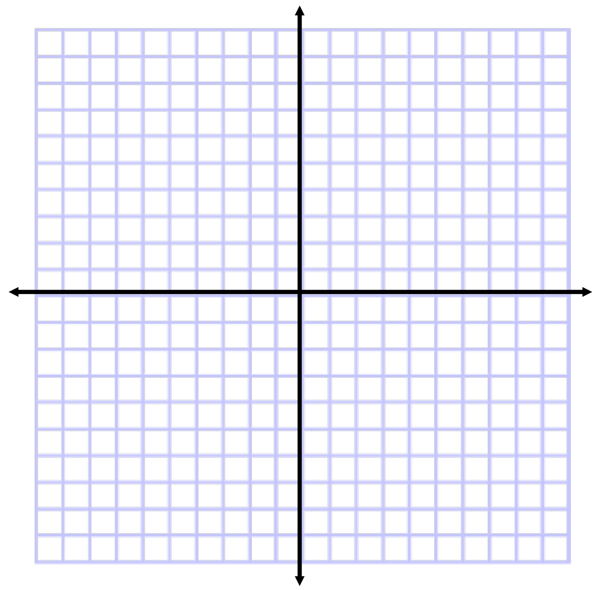
$\boxed{f(x) = 2(x+1)^2 + 4}$

vertex: $(-1, 4)$
a of symm: $x = -1$

Vertex:
Axis of Symmetry:
Transformations:

Graph by using transformations. Identify the vertex and axis of symmetry of the parabola. Based on the graph, determine the domain and range of the quadratic function.

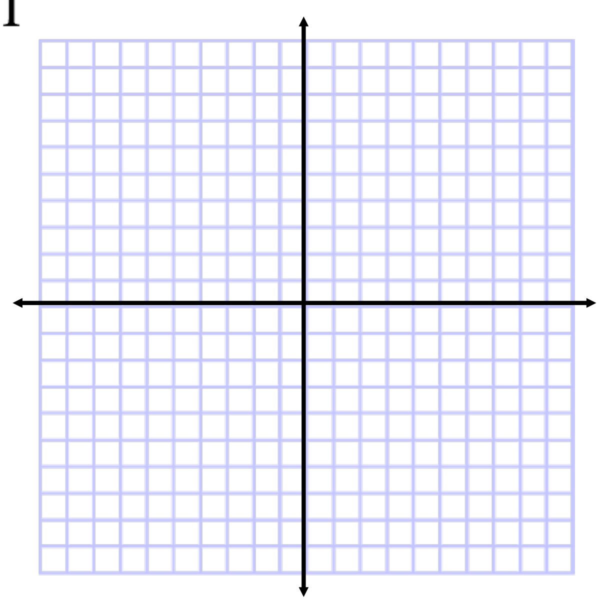
$$f(x) = x^2 + 4x + 3$$



You Try

Graph by using transformations. Identify the vertex and axis of symmetry of the parabola. Based on the graph, determine the domain and range of the quadratic function.

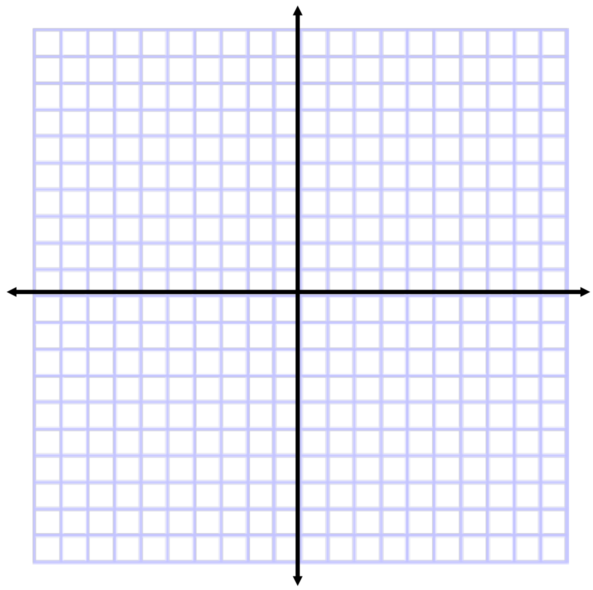
$$f(x) = x^2 + 6x - 1$$



You Try

Graph by using transformations. Identify the vertex and axis of symmetry of the parabola. Based on the graph, determine the domain and range of the quadratic function.

$$f(x) = 2x^2 - 4x + 2$$



Give an equation in function form $f(x) = a(x-h)^2 + k$ of the following graph.