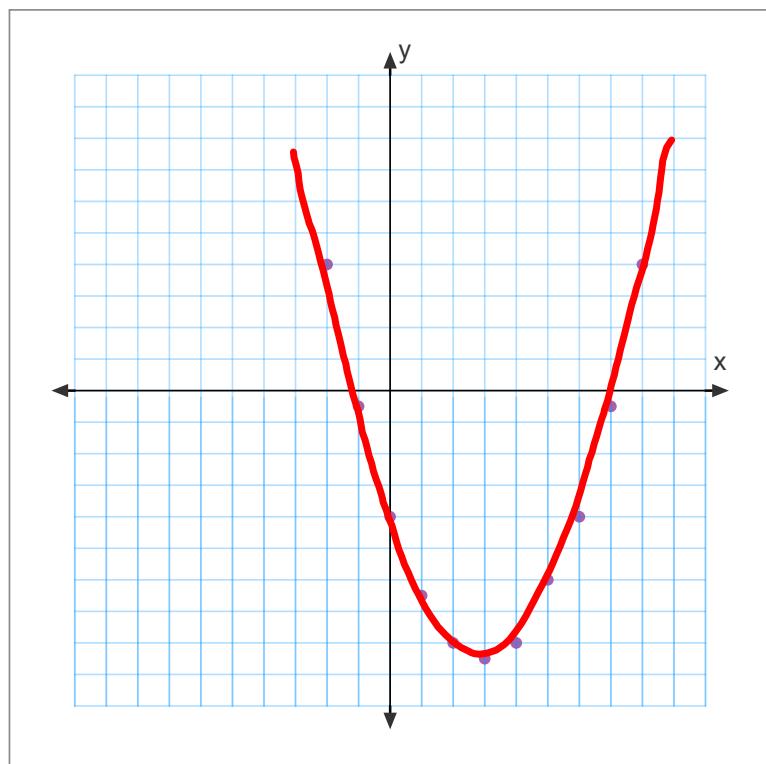


Graph the function $f(x) = \underline{0.5x^2} - 3x - 4$

x	y
0	-4
1	$0.5 - 3 - 4$ -6.5
2	$2 - 6 - 4$ -8
3	$4.5 - 9 - 4$ -8.5
4	$8 - 12 - 4$ -8
5	$12.5 - 15 - 4$ -6.5
6	$18 - 18 - 4$ -4
7	$24.5 - 21 - 4$ -0.5
8	$32 - 24 - 4$ 4
-1	-0.5



Convert $y = -2(x-5)^2 - 10$ to general form.

standard $y = a(x-h)^2 + k$

$y = -2(x^2 - 10x + 25) - 10$

$y = -2x^2 + 20x - 50 - 10$

$y = -2x^2 + 20x - 60$



Converting from General Form to Standard Form

Completing the Square

a) Form: $x^2 + bx + c \quad a = 1$

Recall the perfect square trinomial

$$(x + n)^2 = x^2 + 2nx + \underline{\underline{n^2}}$$

Example: $\underline{x^2} - \underline{10x} - 24$

Step 1: Divide the coefficient of x (b) by 2.

$$-10 \div 2 = \underline{-5} \quad \rightarrow \quad \begin{matrix} (x-5)^2 \\ \text{going to make this} \end{matrix}$$

Step 2: Square this value, then simultaneously add AND subtract the result within the polynomial.

$$(-5)^2 = 25$$

P.S. T

$$\underline{x^2 - 10x + 25} - 25 - 24$$

Step 3: Factor the perfect square trinomial part and add the two constants.

$$\begin{array}{c} x^2 - 10x + 25 - 25 - 24 \\ \swarrow \quad \searrow \\ (x - 5)^2 - 49 \end{array}$$

Complete the square:

a) $x^2 + 8x - 20$

① $\frac{8}{2} = 4$

② $(4)^2 = 16$

③ add/subtract 16

$$\begin{aligned} &x^2 + 8x + 16 - 16 - 20 \\ &\underline{x^2 + 8x + 16} \quad - 16 - 20 \\ &(x+4)^2 - 36 \end{aligned}$$

$(x \quad)$

b) $x^2 - 5x - 14$

① $\frac{-5}{2} = -2.5$

② $(-2.5)^2 = 6.25$

③ add/subtract 6.25

$$\begin{aligned} &x^2 - 5x + 6.25 - 6.25 - 14 \\ &\underline{x^2 - 5x + 6.25} \quad - 6.25 - 14 \\ &(x-2.5)^2 - 20.25 \end{aligned}$$

Example: Convert the function $f(x) = x^2 - 16x + 47$ to standard form.

$$\begin{aligned}
 & f(x) = x^2 - 16x + 47 \\
 & \text{① } -16 \div 2 = -8 \\
 & \text{② } (-8)^2 = 64 \\
 & \text{③ add/subtract 64} \\
 & f(x) = \overbrace{x^2 - 16x + 64}^{\text{p.s.t}} - 64 + 47 \\
 & f(x) = (x - 8)^2 - 17 \\
 & \quad \quad \quad \sqrt{(8, -17)}
 \end{aligned}$$

Example: Convert the function $y = x^2 + 9x - 2$ to standard form.

$$\textcircled{1} \quad 9 \div 2 = 4.5$$

$$\textcircled{2} \quad (4.5)^2 = 20.25$$

\textcircled{3} add/subtract
20.25

$$y = x^2 + 9x - 2$$

$$y = x^2 + 9x + 20.25 - 20.25 - 2$$

$$y = (x + 4.5)^2 - 22.25$$

b) Form $ax^2 + bx + c$ $a \neq 1$

Example: $9x^2 - 18x - 7$

Step 1: Factor a out of only the first two terms .

$$9(x^2 - 2x) - 7$$

Step 2: Inside the parentheses , follow the steps to complete the square .

$$9(x^2 - 2x) - 7$$

$-2 \div 2 = -1$
 $(-1)^2 = 1$
add/subtract $\frac{1}{9}$ (inside the parentheses)

$$9(x^2 - 2x + 1 - 1) - 7$$

Step 3a: Factor the perfect square trinomial.

$$9(x^2 - 2x + 1) - 7 = 9((x-1)^2 - 1) - 7$$

Step 3b: Multiply both terms by the a factored out in step 1.

$$9((x-1)^2 - 1) - 7 = 9(x-1)^2 - 9 - 7$$

Add the constants.

$$9(x-1)^2 - 16$$