

Exercise 12

For the following exercises, rewrite the quadratic functions in standard form and give the vertex.

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

Solution

Begin by factoring the coefficient of x^2 .

$$f(x) = 2(x^2 - 3x)$$

In order to write this quadratic function in vertex form, it's necessary to complete the square, which makes use of the following algebraic identity.

$$(x + B)^2 = x^2 + 2xB + B^2$$

Notice that $2B = -3$, which means $B = -\frac{3}{2}$ and $B^2 = \frac{9}{4}$. Add and subtract $\frac{9}{4}$ on the right side within the parentheses and use the identity so that x appears in only one place.

$$\begin{aligned} f(x) &= 2 \left[\left(x^2 - 3x + \frac{9}{4} \right) - \frac{9}{4} \right] \\ &= 2 \left[\left(x + \left(-\frac{3}{2} \right) \right)^2 - \frac{9}{4} \right] \\ &= 2 \left[\left(x - \frac{3}{2} \right)^2 - \frac{9}{4} \right] \\ &= 2 \left(x - \frac{3}{2} \right)^2 - \frac{9}{2} \end{aligned}$$

Therefore, the vertex of the parabola is $\left(\frac{3}{2}, -\frac{9}{2}\right)$.

