

Exercise 8

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

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

Solution

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 $2B = -1$, which means $B = -\frac{1}{2}$ and $B^2 = \frac{1}{4}$. Add and subtract $\frac{1}{4}$ on the right side and use the identity so that x appears in only one place.

$$\begin{aligned} f(x) &= x^2 - x \\ &= \left(x^2 - x + \frac{1}{4}\right) - \frac{1}{4} \\ &= \left(x + \left(-\frac{1}{2}\right)\right)^2 - \frac{1}{4} \\ &= \left(x - \frac{1}{2}\right)^2 - \frac{1}{4} \end{aligned}$$

Therefore, the vertex of the parabola is $\left(\frac{1}{2}, -\frac{1}{4}\right)$.

