COMPLETING THE SQUARE FOR NON-MONIC EQUATIONS

Completing the square is more difficult when the coefficient of x^2 is not 1. You can overcome this problem by first dividing every term by the coefficient of x^2.

Example 15

Complete the square to solve $2x^2 - 3x - 3 = 0$.

Solution

$2x^2 - 3x - 3 = 0$

$2x^2 - 3x = 3$ — Move constant to RHS

$x^2 - \frac{3x}{2} = \frac{3}{2}$ — Divide by coefficient of x^2

$x^2 - \frac{3x}{2} + \frac{9}{16} = \frac{3}{2} + \frac{9}{16}$ — Add $\left(\frac{3}{4}\right)^2$ to complete the square

$\left(x - \frac{3}{4}\right)^2 = \frac{33}{16}$ — Factorise

$x - \frac{3}{4} = \pm\frac{\sqrt{33}}{4}$ — Take square roots of both sides

$x = \frac{3}{4} + \frac{\sqrt{33}}{4} = \frac{3+\sqrt{33}}{4}$ or $x = \frac{3}{4} - \frac{\sqrt{33}}{4} = \frac{3-\sqrt{33}}{4}$ — Exact answers

$x = 2.19$ or $x = -0.69$ — Answers correct to two decimal places