Solving quadratic equations

3 ways to solve a quadratic equation

For the equation $2x^2 - 3x - 9 = 0$

Factorisation

$2x^2 - 3x - 9 = 0$

$(2x + 3)(x - 3) = 0$

$x = \frac{-3}{2}$ *or* $x = 3$

Using the quadratic formula

$2x^2 - 3x - 9 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-9)}}{2(2)}$

$x = \frac{3 \pm \sqrt{9 + 72}}{4}$

$x = \frac{3 \pm \sqrt{81}}{4}$

$x = \frac{3 \pm 9}{4}$

$x = \frac{3 + 9}{4}$ *or* $x = \frac{3 - 9}{4}$

$x = 3$ *or* $x = -\frac{3}{2}$

Completing the square

$2x^2 - 3x - 9 = 0$

$$2(x^2 - \frac{3x}{2} - \frac{9}{2}) = 0$$
$$2[(x - \frac{3}{4})^2 - (\frac{3}{4})^2 - \frac{9}{2}] = 0$$
$$(x - \frac{3}{4})^2 - \frac{9}{16} - \frac{9}{2} = 0$$
$$(x - \frac{3}{4})^2 - \frac{81}{16} = 0$$
$$(x - \frac{3}{4})^2 = \frac{81}{16}$$
$$x - \frac{3}{4} = \pm\frac{9}{4}$$
$$x = -\frac{3}{2} \; or \; x = 3$$