Completing the Square

Example 1

$3x^2 - 18x - 6 = 0$

$x^2 - 6x - 2 = 0$
1. Get rid of the number in front of x^2, if there is one. (Divide both sides by 3, in this example.)

$x^2 - 6x = 2$
2. Move the constant term to the right side. (Add 2 to both sides.)

$x^2 - 6x + 9 = 2 + 9$
3. Complete the perfect square. (The third number is half the middle number squared.)

$(x - 3)(x - 3) = 11$
4. Factor the left side.

$(x - 3)^2 = 11$

$\sqrt{(x - 3)^2} = \pm\sqrt{11}$
5. Square root both sides, and solve for x. (Don't forget that all numbers except zero have two square roots.)

$(x - 3) = \pm\sqrt{11}$

$x = 3 \pm \sqrt{11}$

A calculator can be used to turn the numbers into decimals.
$3 + \sqrt{11} \approx 6.317 \qquad 3 - \sqrt{11} \approx -0.317$

Example 2

$5x^2 + 40x - 100 = 0$

$x^2 + 8x - 20 = 0$

$x^2 + 8x = 20$

$x^2 + 8x + 16 = 20 + 16$

$(x + 4)(x + 4) = 36$

$(x + 4)^2 = 36$

$\sqrt{(x + 4)^2} = \pm\sqrt{36}$

$x + 4 = \pm 6$

$x = -4 \pm 6$

$x = -10 \text{ or } 2$