

Example of completing the square to solve for x while finding solutions to a function:

Example: Find solutions to $f(x) = 2x^2 + 10x - 11$

$$2x^2 + 10x - 11 = 0 \quad \rightarrow \text{set function} = 0$$

$$2x^2 + 10x = 11 \quad \rightarrow \text{Complete the square Step 1}$$

$$\frac{2x^2}{2} + \frac{10x}{2} = \frac{11}{2} \quad \rightarrow \text{Complete the square Step 2}$$

$$x^2 + 5x = \frac{11}{2}$$

$$x^2 + 5x + \frac{25}{4} = \frac{11}{2} + \frac{25}{4}$$

Complete the square
Step 3:
Divide 5 by 2
 $= 5/2 \rightarrow \text{squared} = \frac{25}{4}$

$$x^2 + 5x + \frac{25}{4} = \frac{47}{4}$$

So we add $\frac{25}{4}$ to both sides.

Now we have a Perfect Square Trinomial on left side.

$$\left(x + \frac{5}{2}\right)^2 = \frac{47}{4}$$

Factor Left side using Rule 5.
 $a^2 + 2ab + b^2 = (a+b)^2$

$$\sqrt{\left(x + \frac{5}{2}\right)^2} = \pm \sqrt{\frac{47}{4}}$$

$$x + \frac{5}{2} = \pm \frac{\sqrt{47}}{\sqrt{4}}$$

$$x + \frac{5}{2} = \pm \frac{\sqrt{47}}{2}$$

$$x = -\frac{5}{2} \pm \frac{\sqrt{47}}{2}$$

Isolate (solve) for x .