

Solve for x in as many different ways as you can

$$f(x) = -2x^2 - x + 10 = 0$$

① Factor

$$\textcircled{2} -20 \mid (-5, 4)$$

$$\textcircled{4} -1 \mid -1$$

$$(-2x^2 + 4x)(-5x + 10) = 0$$

$$-2x(x-2) - 5(x-2) = 0$$

$$(x-2)(-2x-5) = 0$$

$$\begin{aligned} x-2 &= 0 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} -2x-5 &= 0 \\ -2x &= 5 \\ x &= -\frac{5}{2} \end{aligned}$$

Check?

$$x=2$$

$$\begin{aligned} \Rightarrow -2(2)^2 - 2 + 10 \\ = -8 - 2 + 10 = 0 \checkmark \end{aligned}$$

$$x = \frac{5}{2}$$

$$-2\left(-\frac{5}{2}\right)^2 - \left(-\frac{5}{2}\right) + 10$$

$$= -\frac{25}{2} + \frac{5}{2} + 10$$

$$= -\frac{20}{2} + 10 = -10 + 10 = 0 \checkmark$$

② Comp. Sq. (Shortcut)

$$-2\left[x^2 + \frac{1}{2}x + k\right] - k + 10 = 0$$

$$\left(\frac{1}{2}\left(\frac{1}{2}\right)\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

$$-2\left[x^2 + \frac{1}{2}x + \frac{1}{16}\right] - \frac{1}{16} + 10 = 0$$

$$-2\left[x + \frac{1}{4}\right]^2 - \frac{1}{16} + 10 = 0$$

$$-2\left(x + \frac{1}{4}\right)^2 + \frac{1}{8} + 10 = 0$$

$$-2\left(x + \frac{1}{4}\right)^2 + \frac{81}{8} = 0$$

$$-2\left(x + \frac{1}{4}\right)^2 = -\frac{81}{8}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{81}{16}$$

$$x + \frac{1}{4} = \pm \sqrt{\frac{81}{16}}$$

$$x = -\frac{1}{4} \pm \frac{9}{4}$$

$$x = -\frac{1}{4} - \frac{9}{4} = -\frac{10}{4} = \boxed{-\frac{5}{2}}$$

$$x = -\frac{1}{4} + \frac{9}{4} = \frac{8}{4} = \boxed{2}$$

3.1/3.2 Solving quadratic Equations

When we solve equations like:

~~$2x^2 - x + 10 = 0$~~ , the answers have different names.

$x = 2, -\frac{5}{2}$ are called: Solutions to $f(x) = 0$
Zeros of $f(x)$
roots of $f(x)$

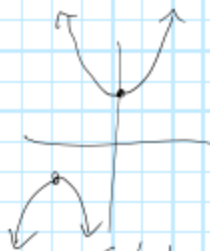
$(x-2)$ and $(-2x-5)$ are factors of $f(x)$

$(2, 0)$ and $(-\frac{5}{2}, 0)$ are x-intercepts of $f(x)$

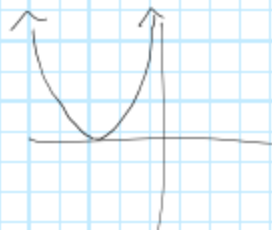
A quadratic can have 2, 1 or 0 solutions.



2 Solutions



0 Solutions



1 Solution

Ex 1 Solve by Factoring, then Check
your answers (3.1)

$$a) 6x^2 + 10 = 7x + 8$$

$$6x^2 - 7x + 2 = 0$$

$$\begin{array}{r} \textcircled{\times} 12 \mid (-3, -4) \\ \textcircled{\times} -7 \mid -7 \end{array}$$

$$6x^2 - 3x - 4x + 2 = 0$$

$$3x(2x-1) - 2(2x-1) = 0$$

$$(2x-1)(3x-2) = 0$$

↑
0

↑
0

$$2x-1=0$$

$$3x-2=0$$

$$2x=1$$

$$3x=2$$

$$x = \frac{1}{2}$$

$$x = \frac{2}{3}$$

Check $x = \frac{1}{2}$

$$6\left(\frac{1}{2}\right)^2 + 10 = 7\left(\frac{1}{2}\right) + 8$$

$$\frac{3}{2} + 10 = \frac{7}{2} + 8$$

$$\frac{23}{2} = \frac{23}{2} \checkmark$$

$x = \frac{2}{3}$

$$6\left(\frac{2}{3}\right)^2 + 10 = 7\left(\frac{2}{3}\right) + 8$$

$$\frac{24}{9} + 10 = \frac{14}{3} + 8$$

$$\frac{8}{3} + 10 = \frac{14}{3} + 8$$

$$\frac{38}{3} = \frac{38}{3} \checkmark$$

$$b) \frac{-11}{x} + \frac{4x}{x-3} = \frac{36}{x^2-3x} \quad (x \neq 0, 3)$$

$$\cdot \left(\frac{-11}{x} + \frac{4x}{x-3} \right) = \left(\frac{36}{x(x-3)} \right) \cdot x(x-3)$$

$$-11(x-3) + 4x(x) = 36$$

$$-11x + 33 + 4x^2 = 36$$

$$4x^2 - 11x - 3 = 0$$

$$\textcircled{\otimes} -12 \mid (1; 2)$$

$$\textcircled{\oplus} -11 \mid -11$$

$$4x^2 - 12x + x - 3 = 0$$

$$4x(x-3) + 1(x-3) = 0$$

$$(x-3)(4x+1) = 0$$

$$\begin{array}{l} \uparrow \\ 0 \\ x-3=0 \end{array} \quad \begin{array}{l} \uparrow \\ 0 \\ 4x+1=0 \end{array}$$

$$x=3$$

$$4x=-1$$

$$x = -\frac{1}{4}$$

Check: $x=3$

$$\frac{-11}{3} + \frac{4(3)}{3-3} = \frac{36}{3^2 - 3(3)}$$

$$\frac{-11}{3} + \frac{12}{0} = \frac{36}{0} \rightarrow \text{undefined}$$

$x=3$ is not
a solution

$$\boxed{x = -\frac{1}{4}}$$

$x = -\frac{1}{4}$

$$\frac{-11}{\left(-\frac{1}{4}\right)} + \frac{4\left(-\frac{1}{4}\right)}{-\frac{1}{4}-3} = \frac{36}{\left(-\frac{1}{4}\right)^2 - 3\left(-\frac{1}{4}\right)}$$

$$44 + \frac{-1}{-\frac{3}{4}} = \frac{36}{\frac{1}{16} + \frac{3}{4}}$$

$$44 + \frac{4}{13} = \frac{36}{\frac{13}{16}}$$

$$44 + \frac{4}{13} = \frac{576}{13}$$

$$\frac{576}{13} = \frac{576}{13} \checkmark$$

Ex 2 Solve by Completing the Square, then
Check your answers (3.2)

$$2x^2 + 14x + 40 = -2x + 8$$

$$2x^2 + 16x + 32 = 0$$

$$2 \left[(x^2 + 8x + 16) - 16 \right] + 32 = 0$$

$$\left(\frac{1}{2}(8) \right)^2 = (4)^2 = 16$$

$$\left(\frac{1}{2}(8)\right)^2 = (4)^2 = 16$$

$$2 \left[(x^2 + 8x + 16) - 16 \right] + 32 = 0$$

$$2 \left[(x + 4)^2 - 16 \right] + 32 = 0$$

$$2(x+4)^2 - 32 + 32 = 0$$

$$\div 2 \quad 2(x+4)^2 = 0 \quad \div 2$$

$$(x+4)^2 = 0$$

$$x+4 = \pm 0$$

$$x = -4 \pm 0$$

$$\boxed{x = -4}$$

Check $x = -4$

$$2(-4)^2 + 14(-4) + 40 = -2(-4) + 8$$

$$32 - 56 + 40 = 8 + 8$$

$$\underline{16 = 16} \quad \checkmark$$