10-5 The Quadratic Formula

The ___QUADRATIC FORMULA___ is the ONLY method

that can be used to solve ANY quadratic equation.

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

☐ Solve the equation using the quadratic formula.

$$6x^2 + 5x - 4 = 0$$
$$ax^2 + bx + c = 0$$

a= $\boxed{6}$ b= $\boxed{5}$ c= $\boxed{-4}$

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

$$x = \frac{-5 \pm \sqrt{5^2 - 4(6)(-4)}}{2(6)}$$

$$x = \frac{-5 \pm \sqrt{25 + 96}}{12}$$

$$x = \frac{-5 \pm \sqrt{121}}{12}$$ $x = \frac{-5+11}{12}$ AND $x = \frac{-5-11}{12}$

$$x = \frac{-5 \pm 11}{12} \Rightarrow$$ $x = \frac{6}{12}$ $x = \frac{-16}{12}$

$\boxed{x = \frac{1}{2}}$ $\boxed{x = -\frac{4}{3}}$

EXAMPLES:

1) $x^2 = x + 20$
$ \quad -x-20 \quad -x \quad -20$

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

$x^2 = x + 20$
$ -x \quad -x$
$x^2 - x = +20$
$ -20 \quad -20$
$x^2 - x - 20 = 0 \quad \leftarrow \text{STANDARD FORM}$

$a = 1 \qquad b = -1 \qquad c = -20$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-20)}}{2(1)}$$
$$x = \frac{1 \pm \sqrt{1 + 80}}{2}$$
$$x = \frac{1 \pm \sqrt{81}}{2}$$
$$x = \frac{1 \pm 9}{2}$$

$x = \frac{1+9}{2}$ AND $x = \frac{1-9}{2}$

$x = \frac{10}{2} \qquad\qquad x = \frac{-8}{2}$

$\boxed{x = 5 \qquad\qquad x = -4}$

CHECK: $x^2 = x + 20$

$(5)^2 = (5) + 20 \qquad (-4)^2 = (-4) + 20$
$25 = 25 \checkmark \qquad\qquad 16 = 16 \checkmark$

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2) $-3x^2 + 5x + 2 = 0$

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

$a = -3 \qquad b = 5 \qquad c = 2$

$$x = \frac{-(5) \pm \sqrt{(5)^2 - 4(-3)(2)}}{2(-3)}$$
$$x = \frac{-5 \pm \sqrt{25 + 24}}{-6}$$
$$x = \frac{-5 \pm \sqrt{49}}{-6}$$
$$x = \frac{-5 \pm 7}{-6} \quad \Rightarrow \begin{array}{c}\text{TWO}\\\text{EQUATIONS}\end{array}$$

$x = \frac{-5+7}{-6}$ AND $x = \frac{-5-7}{-6}$

$x = \frac{2}{-6} \qquad\qquad x = \frac{-12}{-6}$

$\boxed{x = -\dfrac{1}{3} \qquad\qquad x = 2}$

CHECK
$-3x^2 + 5x + 2 = 0$

$-3\left(-\frac{1}{3}\right)^2 + 5\left(-\frac{1}{3}\right) + 2 = 0 \checkmark$

$-3(2)^2 + 5(2) + 2 = 0 \checkmark$