

SOLVING QUADRATIC
EQUATIONS
BY
COMPLETING THE
SQUARE

Section
12.7

PERFECT SQUARE TRINOMIALS

$$x^2+6x+9$$

$$x^2-10x+25$$

$$x^2+12x+36$$

What's the relationship between the middle and last term????

Divide the middle term by 2. Then, square it.
You get the last term!

CREATING A PERFECT SQUARE TRINOMIAL

- How could you turn $x^2 + 14x$ into a perfect square trinomial?
- Divide the middle or linear term by 2. Then, square it to find the constant term.

$$\left(\frac{14}{2}\right)^2 = (7)^2 = 49$$

- $x^2 + 14x + 49$ is a perfect square trinomial.

PERFECT SQUARE TRINOMIALS

Practice

● $x^2 + 20x + \underline{\quad 100 \quad}$ $\left(\frac{20}{2}\right)^2 = (10)^2 = 100$

● $x^2 - 4x + \underline{\quad 4 \quad}$ $\left(\frac{-4}{2}\right)^2 = (-2)^2 = 4$

● $x^2 + 5x + \underline{\quad \frac{25}{4} \quad}$ $\left(\frac{5}{2}\right)^2 = \frac{25}{4}$

SOLVING QUADRATIC EQUATIONS BY CREATING A PERFECT SQUARE TRINOMIAL.

Step 1: Move the constant term to the right. Leave a space for the new constant term.

$$1) \quad x^2 + 8x - 20 = 0$$
$$x^2 + 8x \quad \underline{+20 \quad +20} = 20$$

Step 2: Find the new constant term that completes the square on the left side of the equation. Add that term to both sides. Why BOTH sides?

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

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

Step 3: Factor the left side of the perfect square trinomial. Simplify the right side of the equation.

$$(x + 4)^2 = 36$$

Step 4: Solve using square roots.

$$x + 4 = \pm\sqrt{36}$$

$$x = -4 \pm 6$$

$$x = 2, x = -10$$

SOLVE BY COMPLETING THE SQUARE

$$2) \quad x^2 - 6x - 16 = 0$$

$$x^2 - 6x \quad \underline{+16 \quad +16} = 16$$

$$\left(\frac{-6}{2}\right)^2 = (-3)^2 = 9$$

$$x^2 - 6x + 9 = 16 + 9$$

$$(x - 3)^2 = 25$$

$$x - 3 = \pm\sqrt{25}$$

$$x = 3 \pm 5$$

$$x = 8$$

$$x = -2$$

$$3) \quad x^2 - 2x - 5 = 0$$

$$x^2 - 2x \quad \underline{+5 \quad +5} = 5$$

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

$$x^2 - 2x + 1 = 5 + 1$$

$$(x - 1)^2 = 6$$

$$x - 1 = \pm\sqrt{6}$$

$$x = 1 \pm \sqrt{6}$$

$$x \approx 3.4$$

$$x \approx -1.4$$

SOLVE BY COMPLETING THE SQUARE

$$4) x^2 + 8x + 11 = 0$$

$$x^2 + 8x \overset{-11}{\underset{-11}{-}} = -11$$

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

$$x^2 + 8x + 16 = -11 + 16$$

$$(x + 4)^2 = 5$$

$$x + 4 = \pm\sqrt{5}$$

$$x = -4 \pm \sqrt{5}$$

$$x \approx -1.8$$

$$x \approx -6.2$$

$$5) x^2 - 6x + 4 = 0$$

$$x^2 - 6x \overset{-4}{\underset{-4}{-}} = -4$$

$$\left(\frac{-6}{2}\right)^2 = (-3)^2 = 9$$

$$x^2 - 6x + 9 = -4 + 9$$

$$(x - 3)^2 = 5$$

$$x - 3 = \pm\sqrt{5}$$

$$x = 3 \pm \sqrt{5}$$

$$x \approx 5.2$$

$$x \approx 0.8$$