

4.6

COMPLETING THE SQUARE

OBJECTIVE: STUDENTS WILL SOLVE A QUADRATIC EQUATION USING "COMPLETING THE SQUARE."

RECALL: $(x+3)^2 = x^2 + 6x + 9$

So, $x^2 + 6x + 9 = (x+3)^2$

$$x^2 - 8x + 16 = (x-4)^2$$

$$x^2 - 12x + 36 = (x-6)^2$$

$$x^2 + 3x + \frac{9}{4} = \left(x + \frac{3}{2}\right)^2$$

PATTERN? YES!

$$x^2 - 10x + \square$$

WHAT IF WE HAD

$$x^2 - 10x + 17$$

$$x^2 - 10x + 25 - 25 + 17$$

$$(x-5)^2 - 8$$

ALSO RECALL SOLVING BY
TAKING SQUARE ROOTS

Ex: SOLVE $x^2 - 3 = 0$

$$x^2 - 3 = 0$$

$$x^2 = 3$$

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

Ex: SOLVE $x^2 + 10x + 25 = 4$

$$x^2 + 10x + 25 = 4$$

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

$$\sqrt{(x + 5)^2} = \pm\sqrt{4}$$

$$x + 5 = \pm 2$$

$$x = -5 \pm 2$$

$$x = -5 + 2$$

OR

$$x = -5 - 2$$

$$x = -3$$

OR

$$x = -7$$

Ex: Solve $x^2 + 8x + 3 = 5$

$$x^2 + 8x + 3 = 5$$

$$x^2 + 8x = 2$$

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

$$(x+4)^2 = 18$$

$$x+4 = \pm\sqrt{18}$$

$$x = -4 \pm \sqrt{18} = -4 \pm 3\sqrt{2}$$

NOTE: TO "COMPLETE THE SQUARE," WE MUST HAVE A $1x^2$.

IF IT IS NOT $1x^2$,

THEN MAKE IT A $1x^2$.

BUT HOW? ...

Ex: Solve $3x^2 + 9x - 2 = 5$

$$3x^2 + 9x - 2 = 5$$

$$\frac{3x^2 + 9x}{3} = \frac{7}{3}$$

$$x^2 + 3x = \frac{7}{3}$$

$$x^2 + 3x + \frac{9}{4} = \frac{55}{12} + \frac{9}{4}$$

$$\left(x + \frac{3}{2}\right)^2 = \frac{55}{12}$$

$$x + \frac{3}{2} = \pm \sqrt{\frac{55}{12}}$$

$$x = -\frac{3}{2} \pm \sqrt{\frac{55}{12}}$$