Thu. 11/6 Agenda:

* Review HW for Sec. 7.6
* Begin 7.7 on quadratic equations, incl. 4 methods of solving.
  Sec. 7.7 HW #1-4, 9-35 odd, 37-48 all

Nov 6-8:15 AM

43) $16a^2 + \underbrace{10ab - 24ab}_{} - 15b^2$

$16a^2$	$-15b^2$	$-240a^2b^2$
$2a$	$5b$	$10ab$
$8a$	$-3b$	$-24ab$

Target Sum

$-14ab$

grf

$\boxed{(2a-3b)(8a+5b)}$

Nov 6-9:59 AM

$-53zx$

45) $20z^2 - 8zx - 45zx + 18x^2$

$20z^2$	$18x^2$	$\underline{360}x^2z^2$
$-4z$	$+2x$	$-8zx$
$-5z$	$+9x$	$-45zx$

Target sum

$-53zx$

$(4z-9x)(5z-2x)$

$(-4z+9x)(-5z+2x)$

$+20z^2\ldots$

Nov 6-10:04 AM

87)

$x^2 + xy - 5x - 5y$

$x(x+y) - 5(x+y)$

$(x-5)(x+y)$

x^2	$-5y$	$-5x^2y$
x	y	xy
x	-5	$-5x$

sum: $xy - 5x$

$(x-5)(x+y)$

Nov 6-10:12 AM

Solving Quadratic Equations

$$ax^2 + bx + c = 0$$

Four Methods:

1. Factoring,
2. Square Root Method,
3. Completing the Square, and
4. Quadratic Formula

Each method works better for certain kinds of problems.

Nov 6-8:27 AM

Method 1: Factoring and the ZPP

The ZPP (zero product principle) states:

If ab = 0, then either a = 0 or b = 0.

From PS4 #5:

Solve: $3x^2 + x = 10$

$3x^2 + x - 10 = 0$

$\frac{(3x-5)(3x+6)}{3} = 0$ (-30) $-5x+6$

$\frac{(3x-5)(\cancel{3})(x+2)}{\cancel{3}} = 0$

by Z.P.P. either

$3x-5=0$

$x = 5/3$

OR

$x+2=0$

$x=-2$

So $x \in \{\frac{5}{3}, -2\}$.

Solve: (x+2)(2x-3) = 15

$2x^2 + x - 6 = 15$

$\Rightarrow 2x^2 + x - 21 = 0$

$\Rightarrow (2x+7)(x-3) = 0$

$\Rightarrow 2x+7=0$ OR $x-3=0$

$\Rightarrow x = -\frac{7}{2}$ OR $x=3$

$\Rightarrow x \in \{-\frac{7}{2}, 3\}$

Nov 6-8:30 AM

Method 2: Square Root Method

The SRP (square root principle) states:

If $x^2 = k$ and $k \geq 0$, then the two solutions are $x = \pm\sqrt{k}$.

Solve: $p^2 - 25 = 0$

$\Rightarrow p^2 = 25$

$\Rightarrow p = \pm\sqrt{25} = \pm 5.$

$\Rightarrow p \in \{5, -5\}$

Nov 6-8:18 AM

Method 2: Square Root Method

The SRP (square root principle) states:

If $x^2 = k$ and $k \geq 0$, then the two solutions are $x = \pm\sqrt{k}$.

Solve: $(x+3)^2 = 12$

$\Rightarrow (x+3) = \pm\sqrt{12}$
$\quad -3 \qquad -3$

$\Rightarrow x = -3 \pm\sqrt{12}$

$\Rightarrow x \in \{-3+\sqrt{12}, -3-\sqrt{12}\}$

Check: $(\cancel{-3}+\sqrt{12}+\cancel{3})^2 \stackrel{?}{=} 12$

$\Rightarrow (\sqrt{12})^2 \stackrel{?}{=} 12$ ✓

Nov 6-8:18 AM

Method 3: Complete the Square

A perfect square trinomial (PST) has the form
$(x+d)^2 = x^2 + 2dx + d^2$.

Which of the following are PST's?

A) $x^2 + 8x + 16$ ✓ $(d=4)$
$x^2 + 2(4)x + 4^2$

X B) $x^2 + 12x + 24$
$d=6$

C) $x^2 - 4x + 4$
$x^2 + 2(-2)x + (-2)^2$ ✓ $(d=-2)$

X D) $x^2 - 6x - 9$
$d=-3$

Method 3: Complete the Square

A perfect square trinomial (PST) has the form
$(x+d)^2 = x^2 + 2dx + d^2$.

Make the following into PST's.

E) $x^2 - 18x +$ 81

F) $x^2 + 10x +$ 25

Describe your process.

Take half of the coeff. of x and add its square.

Method 3: Complete the Square

A perfect square trinomial (PST) has the form
$(x+d)^2 = x^2 + 2dx + d^2$.

Solve by 1) completing the square to form a perfect square trinomial and then 2) applying the square root principle:

A) $x^2 - 8x = 6$

$\Rightarrow$ ① $x^2 - 8x + \underline{16} = 6 + \underline{16}$

$\Rightarrow (x-4)^2 = 22$

$\Rightarrow$ ② $(x-4) = \pm\sqrt{22}$ $\Rightarrow x = 4 \pm \sqrt{22}$

+4 +4

B) $(x^2 + 4x) - 13 = 0$

+13 +13

$\Rightarrow x^2 + 4x = 13$

$\Rightarrow x^2 + 4x + \underline{4} = 13 + \underline{4}$

$\Rightarrow (x+2)^2 = 17$

$\Rightarrow x + 2 = \pm\sqrt{17}$

$\Rightarrow x = -2 \pm \sqrt{17}$

$\Rightarrow x \in \{-2+\sqrt{17}, -2-\sqrt{17}\}$

Nov 6-8:39 AM

Method 4: The Quadratic Formula:

If $ax^2 + bx + c = 0$, then the two solutions are:

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

(Proof is based on completing the square).

Before we practice, let's review what we have so far:

Method 1: Factor and use ZPP
Method 2: Use the Square Root Principle
Method 3: Complete the Square, then use Method 2.
Method 4: Use the Quadratic Formula, then Simplify.

PS4 #4 asks you to reflect on the types of problems that are best handled by each of these methods.

For instance, the Quadratic Formula "always works," but it is cumbersome and may not be the best approach in all cases.

Nov 6-8:49 AM

Method 4: The Quadratic Formula:

If $ax^2 + bx + c = 0$, then the two solutions are:

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

Solve using the quadratic formula:

A) $2x^2 + 5x + 7 = 0$

$a = 2$
$b = 5$
$c = 7$

$$x = \frac{-5 \pm \sqrt{25 - 4(2)(7)}}{2(2)}$$

$$x = \frac{-5 \pm \sqrt{-31}}{4}$$

$\sqrt{-31}$ is not a real #.

There is not a real solution!

B) $2x^2 - 12x = -13$

$2x^2 - 12x + 13 = 0$

$a = 2$
$b = -12$
$c = 13$

$$x = \frac{+12 \pm \sqrt{144 - 4(2)(13)}}{4}$$

$$x = \frac{12 \pm \sqrt{40}}{4}$$

$$x = \frac{12}{4} \pm \frac{\sqrt{40}}{4}$$

⋮

work on simplifying this further next time.