Warm-Up: Factor!

① $(b-1)\left[(b-1)a^2+2(b-1)a-8(b-1)\right]$

$(b-1)$ is a common factor

$(b-1)(a^2+2a-8)$

⊗ -8	(-2,4), (4,-2), (1,-8), (-1,8)
⊕ 2	2

$=(b-1)(a-2)(a+4)$ Check?

Today, we are factoring ax^2+bx+c

We need to find 2 numbers p, q so that

$p+q=b$; $p \cdot q = a \cdot c$ (last class $= 1$)

NOTE: p, q are NOT factors in this case

② $(x^2-8x+16)-y^2$ — Perfect Square quadratics

⊗ 16	(4,4), (-4,-4), (1,16), (-1,-16), (2,8), (-2,-8)
⊕ -8	8 -8

$(x-4)(x-4)-y^2$

$=(x-4)^2-y^2$

$\sqrt{1^{st}} = \sqrt{(x-4)^2} = x-4$ ← a

$\sqrt{last} = \sqrt{y^2} = y$ ← b

$=\left((x-4)^{a}-y^{b}\right)\left((x-4)^{a}+y^{b}\right)$

Ex 1 Factor $6x^2 + 11x + 4$

$6 \cdot 4$

⊗	24	$(1,24)$, ~~$(-1,-24)$~~,	$(2,12)$,	$(4,6)$,	$(3,8)$
+	11	25	14	10	11

(2) Split the middle term

$(6x^2 + 3x)(+8x + 4)$

(3) factor the pairs

$(6x^2 + 3x) + (8x + 4)$

$= 3x(2x+1) + 4(2x+1)$

(4) Factor the common factor

$(2x+1)(3x+4)$

Check

11

$= 6x^2 + 8x + 3x + 4 = 6x^2 + 11x + 4$

Ex 2 Factor $\dfrac{-4x^2 - 14x + 8}{-2}$

$= -2(2x^2 + 7x - 4)$

$2 \cdot -4$

$\otimes$ -8 | $(-1, 8), (-8, 1), (-2, 4), (-4, 2)$

$\oplus$ 7 | 7

$= -2[(2x^2 - x + 8x - 4)]$

$= -2[(2x^2 - x) + (8x - 4)]$

$= -2[x(2x - 1) + 2(4x - 2)]$

$= -2[x(2x - 1) + 4(2x - 1)]$

$= -2[(2x^2 + 8x - x - 4)]$

$= -2[(2x^2 + 8x) + (-x - 4)]$

$= -2[2x(x + 4) - 1(x + 4)]$

$= -2\left[(2x-1)(x+4)\right]$ $= -2\left[(x+4)(2x-1)\right]$

Special Case #2

Perfect Squares

Notice $(a+b)^2 = (a+b)(a+b) = a^2+ab+ab+b^2$

$(a+b)^2 = a^2+2ab+b^2$

$(a-b)^2 = (a-b)(a-b) = a^2-ab-ab+b^2$

$(a-b)^2 = a^2-2ab+b^2$

If the 1st and last term are positive, perfect squares, check middle term

If the middle is $= \pm 2\sqrt{1^{st}} \cdot \sqrt{last}$ then we have a perfect square quadratic

Ex 3 Factor $4x^2 + 12x + 9$

$\sqrt{1^{st}} = \sqrt{4x^2} = 2x$

$\sqrt{last} = \sqrt{9} = 3$

Check Middle: $\pm 2(2x)(3) = \pm 12x$

$= (2x \pm 3)^2$

Ex 4 Factor $-18a^3 + 24a^2b - 8ab^2$

$-2a$

$= -2a(9a^2 - 12ab + 4b^2)$

$\sqrt{1st} = \sqrt{9a^2} = 3a$

$\sqrt{last} = \sqrt{4b^2} = 2b$

check middle: $\pm 2(3a)(2b) = -12ab$

$= -2a(3a - 2b)^2$

Summary

1. Common factor

2. Special Cases

Diff. Sq.
Perf. Sq.

To check $\sqrt{1^{st}}$ and $\sqrt{last}$

3. $x^2 + bx + c \Rightarrow$ use what we learned last class

4. $ax^2 + bx + c \Rightarrow$ use what we learned today

5. Check by multiplying

Mon: Work time

Wed: Quiz (1.1, 1.2)