Warm-Up: Factor!

① $(b-1)\left(\frac{(b-1)a^2+2(b-1)a-8(b-1)}{(b-1)}\right)$

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

$\times$ -8	$(1,-8)$	$(-1,8)$	$(-2,4)$	$(4,-2)$
$+$ $+2$	-7	7	2	

$=(b-1)(a-2)(a+4)$ check

Today, we will be factoring

ax^2+bx+c

We need to find 2 numbers p, q so that

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

NOTE: p, q are not factors in this case

② $(x^2-8x+16)-y^2$ (perfect square quadratics)

$\times$ 16	$(1,16)$,	$(-1,-16)$,	$(-2,-8)$,	$(-4,-4)$
$+$ -8	17	-17	-10	-8

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

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

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

$\sqrt{2^{nd}}=\sqrt{y^2}=y$ ← '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	$(1,24)$,	$(-1,-24)$,	$(3,8)$,	$(2,12)$, $(4,6)$
+	11	25		11	

② Split the middle term

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

③ Factor 1st and last pair

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

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

④ Factor out Common factor

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

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

$= 6x^2 + 11x + 4$ (11)

Ex 2 Factor $-4x^2 - 14x + 8$

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

$2 \cdot -4$

⊗ -8	$(2,-4)$,	$(-2,4)$,	$(1,-8)$,	$(-1,8)$
⊕ $+7$	-2	2	-7	$+7$

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

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

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

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

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

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

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

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

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 then check middle term

If middle term is

$\pm 2\sqrt{1^{st}} \cdot \sqrt{last}$

then we have a perfect square

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

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

$\sqrt{last} = \sqrt{9} = 3$ ← b

Check middle: $\pm 2(2x)(3)$

$= \pm 12x$

$(2x \pm 3)^2$

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

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

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

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

Check middle: $\pm 2(3a)(2b)$

$= \pm 12ab$

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

Summary

1. Common factor
2. Special cases — Diff. Sq. / Perf. Sq.

Check $\sqrt{1^{st}}$ and $\sqrt{last}$

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

4. $ax^2 + bx + c$ -> use what we did today

5. Check by multiplying

Mon: work time

Wed: Quiz (1.1, 1.2)