3.8a Factoring special polynomials

I. Trinomials with 2 variables

If a trinomial is of the form $ax^2 + bxy + cy^2$, factor as usual (3.5) but add the extra variable at the end of the factored binomials.

$x^2 + bx + c$

ex. $a^2 + 4a - 77$

$11 \cdot -4 = -77$

$11 + -4 = 4$

$= (x + 11)(x - 4)$

$ax^2 + bxy + cy^2$

ex. $a^2 + 4ab - 77b^2$

same — add the "b" at the end

$(a + 11b)(a - 4b)$

ex. $2x^2 + x - 3$

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

ex. $2x^2 + xy - 3y^2$

$= (2x + 3y)(x - y)$

same coefficients

ex. $12m^2 + 5m - 3$

$= (4m + 3)(3m - 1)$

ex. $12m^2 + 5mn - 3n^2$

$(4m + 3n)(3m - n)$

add the 2nd variable

II. A perfect Square Trinomial is a trinomial that breaks down into two identical factors. Thus, its area model is a square.

ex. $p^2 + 10pq + 25q^2$

$5 \cdot 5 = 25$

$5 + 5 = 10$

when the two factors are the same you know it's a perfect square trinomial

$= (p + 5q)(p + 5q)$

$= (p + 5q)^2$

III. A Difference of Squares ... are of the form

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

a D.O.S. is always a binomial with a negative in the middle!

ex. a) $y^2 - 25$

$= (y-5)(y+5)$

$-5y + 5y = 0y$

b) $x^2 - 169$

$= (x-13)(x+13)$

c) $9x^2 - 49$

$= (3x+7)(3x-7)$

d) $16x^4 - z^6$

$= (4x^2+z^3)(4x-z^3)$

e) $121x^4y^2 - 64y^8$

$= (11x^2y+8y^4)(11x^2y-8y^4)$

f) $5x^4 - 80y^4$

always common factor 1st if possible

$= 5(x^4-16y^4)$

$= 5(x^2+4y^2)(x^2-4y^2)$ still a D.O.S

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

e) $162a^4 - 2w^8$

$= 2(81a^4 - w^8)$

$= 2(9a^2+w^4)(9a^2-w^4)$

$= 2(9a^2+w^4)(3a+w^2)(3a-w^2)$

Practice: pg. 194 #4aceg, 6, 7,10aceg, 11a, 13acf, 15, 18, 19-21

a) $a^2+4a-77$

b) $a^2-4ab-77b^2$

c) $2x^2+x-3$

d) $2x^2+xy-3y^2$

e) $12m^2+5m-3$

f) $12m^2+5mn-3n^2$

g) $p^2+10pq+25q^2$

h) $4x^2-20x+25$

i) $y^2+0y-25$

$-5\cdot+5=-25$

$-5+5=0$

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

j) $x^2+0xy-169y^2$

$=(x-13y)(x+13y)$

k) $9x^2+0xy-49y^2$

l) $4x^2-36=4(x^2-9)$

$=4(x+3)(x-3)$

$(2x+6)(2x-6)$

m) $25w^2-36x^2$

n) $16x^4-z^6$

$=(4x^2-z^3)(4x^2+z^3)$

o) $121x^4y^2-64y^8$

p) $5x^4-80y^4$

$=5(x^4-16y^4)$

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

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

q) $162a^4-2w^8$