Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.4 Factoring Quadratic Expressions of the form ax^2+bx+c

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Learning Goals:

- If the quadratic expression $ax^2 + bx + c$, where $a \neq 1$ can be factored, then the factors are of the form $(px + r)(qx + s)$, where $pq = a$, $rs = c$, and $ps + rq = b$.
- A trinomial of the form $ax^2 + bx + c$ can be factored if two integers can be found whose product is ac and whose sum is b.
- The decomposition method involves decomposing b into a sum of two numbers whose product is ac.

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<u>First Step</u> (Always check for this first)

Check for a common factor in a,b and c. This means that you could end up using a factoring method similar to last class.

Example:

$3x^2 - 12x - 36$
$=3(x^2 - 4x - 12)$ -Common Factor a 3
$=3(x+2)(x-6)$ -Factor the result using the earlier method

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Decomposition:

Decomposition means "to break something down"

We break apart the middle term in a trinomial to factor more effectively by grouping.

Example: $2x^2 + 7x + 6$

$2x^2 + 7x + 6$	- We want to break apart 7x into two more useful terms
$=2x^2 + 7x + 6$	(6)x(2) = 12, we need two numbers that
$=2x^2 + 4x + 3x + 6$	Multiply to 12 and add to 7.

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Decomposition:

Example: $2x^2 + 7x + 6$

$=2x^2 + 4x + 3x + 6$ - Now common factor the two pairs

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

$=2x(x + 2) + 3(x + 2)$ - Notice that the two groups in brackets

$= (x + 2)(2x + 3)$ are the same;

$$2x^2 + 7x + 6 = (x + 2)(2x + 3)$$

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Example:

$6x^2 - 7x - 3$ - Two Numbers that Multiply to -18

$= 6x^2 - 9x + 2x - 3$ and add to -7 are -9 and 2.

$= (6x^2 - 9x) + (2x - 3)$ - Common Factor each pair

$= 3x(2x - 3) + 1(2x - 3)$ - Factor out (2x-3) from both

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

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Example:

$4x^2 - 3x - 1$ - Two Numbers that Multiply to -3

$= 4x^2 - 4x + 1x - 1$ and add to -3 are -4 and 1.

$= (4x^2 - 4x) + (x - 1)$ - Common Factor each pair

$= 4x(x - 1) + 1(x - 1)$ - Factor out (x - 1) from both

$= (x - 1)(4x + 1)$

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Homework:

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