


Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.3 Factoring Quadratic Expressions: x^2+bx+c



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Learning Goals:

- If they can be factored, quadratic expressions of the form $x^2 + bx + c$ can be factored into two binomials $(x + r)(x + s)$, where $r + s = b$ and $r \times s = c$, and r and s are integers.
- To factor $x^2 + bx + c$ as $(x + r)(x + s)$, the signs in the trinomial can help you determine the signs of the numbers you are looking for:

Trinomial	Factors
$x^2 + bx + c$	$(x + r)(x + s)$
$x^2 - bx + c$	$(x - r)(x - s)$
$x^2 - bx - c$	$(x - r)(x + s)$, where $r > s$
$x^2 + bx - c$	$(x + r)(x - s)$, where $r > s$



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Product Sum Factoring

Given $x^2 + bx + c$

we need 2 numbers that have

- a sum of b ($r + s = b$)
- a product of c ($r \times s = c$)



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Product Sum Factoring

Example: $x^2 + 11x + 30$

We need two numbers that ;

1. Multiply to 30
2. Add to 11



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Product Sum Factoring

Example: $x^2 + 11x + 30$

Write out all of the factors of 30 in a chart starting with 1.

r	s	r+s	r-s
1	30	31	29
2	15	17	13
3	10	13	7
5	6	11	1



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Product Sum Factoring


Example: $x^2 + 2x - 48$

Some notes:

1. $r \times s$ must equal -48.

This means that one of r or s must be negative!

2. If one of r or s is negative, we will use the $|r-s|$ column to select our sum.



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Product Sum Factoring

Example: $x^2 + 11x + 30$

Since $5 \times 6 = 30$ **AND** $5 + 6 = 11$, we have found out two values

Therefore:

$$x^2 + 11x + 30 = (x + 5)(x + 6)$$



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Product Sum Factoring

Example: $x^2 + 2x - 48$

Write out all of the factors of -48 in a chart starting with 1.

r	s	r+s	r-s
1	48	49	47
2	24	26	22
3	16	19	13
4	12	16	8
6	8	14	2



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Product Sum Factoring

Example: $x^2 + 2x - 48$

So we know that two values must be 6 and 8. now which must be the negative number?

In this case, since $r + s = 2$, this is a positive number.

This means that the positive number must be the larger of the two.

8 must be positive, 6 must be negative.

$$x^2 + 2x - 48 = (x+8)(x-6)$$



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Factor each expression.

a) $x^2 + 7x + 12$

b) $a^2 - 10a + 21$

c) $x^2 + 4x + 5$



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Rules for positive and Negatives when factoring:

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Factor $4x^2 + 16x - 48$.



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Homework:

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Unit 2 - Mid Chapter Review

Homework:

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