

5.4 Factor Quadratic Expressions of the Form $x^2 + bx + c$

A Factoring $x^2 + bx + c$

Example 1. Expand $(x + p)(x + q)$. Simplify the answer and make connection to $x^2 + bx + c$.

Conclusion: To factor the trinomial $x^2 + bx + c$

- ✓ Find two integers p and q so:

$$pq = c \quad \text{and} \quad p + q = b$$

- ✓ Replace the trinomial $x^2 + bx + c$ by the equivalent factored expression $(x + p)(x + q)$

Example 2. For each case, find two integers p and q satisfying the required conditions.

a)

$$\begin{aligned} pq &= 6 \\ p + q &= 5 \end{aligned}$$

b)

$$\begin{aligned} pq &= -6 \\ p + q &= 1 \end{aligned}$$

c)

$$\begin{aligned} pq &= -6 \\ p + q &= -1 \end{aligned}$$

d)

$$\begin{aligned} pq &= -6 \\ p + q &= -5 \end{aligned}$$

e)

$$\begin{aligned} pq &= 42 \\ p + q &= -13 \end{aligned}$$

f)

$$\begin{aligned} pq &= -12 \\ p + q &= 6 \end{aligned}$$

Example 3. Factor fully, if possible.

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

b) $x^2 + x - 20$

c) $x^2 - 2x - 35$

d) $x^2 - 9x - 36$

e) $-x^2 + 11x - 28$

f) $x^2 + x + 1$

Example 4. Factor fully, if possible.

a) $x^2 - 2xy - 48y^2$

b) $x^2 + 14xy + 45y^2$

c) $x^2 + 4xy - 12y^2$

Example 5. Factor fully by factoring first the GCF.

a) $-2x^3y + 4x^2y + 48xy$

b) $5ax^2y + 20axy + 60ay$

c) $-\frac{x^3y^2}{2} + \frac{11x^2y^3}{2} + 30xy^4$

Example 6. Find the value of the parameter k , such that the following trinomial may be factored over the integers.

a) $x^2 + kx - 6$

b) $x^2 + 6x + k$

B Technology (scientific calculator)

- ✓ Use a scientific calculator to find x_1 and x_2 for the equation $x^2 + bx + c = 0$
- ✓ Substitute x_1 and x_2 into $(x - x_1)(x - x_2)$ to get the factored form

Example 7. Use a scientific calculator to factor.

Watch a Loom Video with [Casio](#) fx-991 ES PLUS

a) $x^2 + 5x - 750$

b) $x^2 + 0.5x - 1$ (optional)

c) $x^2 + \pi x - 2$ (optional)

d) $x^2 + x + 1$ (optional)

C Technology (Wolfram Alpha)

- ✓ Search the Internet for Wolfram Alpha or use this link: <https://www.wolframalpha.com/>
- ✓ Enter: factor x^2-x-2 or zeros of x^2-x-2 (see the figure below)



- ✓ Click on the  button to get the answer

Example 8. Use Wolfram Alpha to factor.

a) $x^2 + 6x - 391$

b) $x^2 + \pi x - 2$ (optional)

c) $x^2 + x + 1$ (optional)

Notes: Textbook Pages 236-240

Homework: Textbook Pages 240-241 #1ab, 2ab, 3ab, 4ab, 5ab, 7ab, 8ab, 9ab, 11, 13, 15, 16cd