Aim How do we factor trinomials by using special cases?

DoNow

1. $(x + 1)(x - 1) =$
3. $(x + 1)(x + 1) =$
5. $(x - 1)(x - 1) =$
2. $(x + 2)(x - 2) =$
4. $(x + 2)(x + 2) =$
6. $(x - 2)(x - 2) =$

Lesson

1. **Factoring the difference of two perfect squares**
   a. When two binomials have the form $\boldsymbol{A + B}$ and $\boldsymbol{A - B}$, they cab be quickly multiplied together as $\boldsymbol{A^2 - B^2}$.
   b. Therefore, whenever you encounter a binomial that has the form $A^2 - B^2$, you can reverse the multiplication by factoring the binomial as $\boldsymbol{(A + B)(A - B)}$.
   c. **Example**: Multiplication— $(x + 3)(x - 3) = x^2 - 3^2 = x^2 - 9$
      Factoring— $x^2 - 9 = x^2 - 3^2 = (x + 3)(x - 3)$
   d. **Exercise:** Factor the following polynomials as the products of two binomials:
      1) $x^2 - 100$ 2) $9x^2 - 49$ 3) $16\,x^2 - 25$

2. **Factoring a perfect square trinomial**
   a. When you multiply a binomial by itself, you are ***squaring a binomial***. The result is a ***perfect square trinomial***.
   b. When you factor a perfect square trinomial, the two binomial factors are the same.
   c. For all real numbers $\boldsymbol{a}$ and $\boldsymbol{b}$:

      $$\boldsymbol{a^2 + 2ab + b^2 = (a + b)(a + b) = (a + b)^2}$$
      $$\boldsymbol{a^2 - 2ab + b^2 = (a - b)(a - b) = (a - b)^2}$$

   d. **Example**:
      1) $x^2 + 10\,x + 25 = (x + 5)(\,x + 5) = (x + 5)^2$
      2) $x^2 - 10\,x + 25 = (x - 5)(\,x - 5) = (x - 5)^2$
   e. **Exercise:** Factor the following polynomials as the products of two binomials:
      1) $x^2 + 4x + 4$ 2) $x^2 + 6x + 9$

3) $x^2 - 20x + 100$

4) $x^2 - 8x + 16$

5) $9x^2 + 24x + 16$

6) $4x^2 + 12x + 9$

7) $25x^2 - 40x + 16$

8) $16x^2 - 56x + 49$

3. **Factoring polynomials completely**

   a. A polynomial is factored completely when each of its factors cannot be factored further.

   b. **Example**:

      1) $10x^2 - 40 = 10(x^2-4) = 10(x + 2)(x - 2)$

      2) $2x^3 - 72x = 2x(x^2-36) = 2x(x + 6)(x - 6)$

   c. **Exercise:** Factor the following polynomials completely:

      1) $2x^3 - 50x$

      2) $3x^3 + 18x^2 - 48x$

      3) $10x^4 + 50x^3 - 500x^2$

      4) $2x^3 - 72x$

      5) $2x^2 + 14x + 20$

      6) $3x^2 + 15x + 12$

1. $x^2 - 4 =$	2. $x^2 + 8x + 16 =$
3. $3x^3 - 9x^2 + 6x =$	4. $9x^2 - 49 =$
5. $x^2 - 6x + 9 =$	6. $4x^2 + 12x + 9 =$
7. $5x^2 + 10x - 15 =$	8. $4x^2 - 100 =$
9. $2x^3 - 8x^2 + 8x =$	10. $x^2 - 8x + 16 =$
11. $-x^2 - 2x + 15 =$	12. $x^2 - 36 =$