# P4 (part 2) Special Factoring

## U – Method To factor a trinomial that is in quadratic form

$\boldsymbol{au^2 + bu + c}$, where $u$ is something weird

1. Replace the first variable with $u^2$ and replace the middle variable with $u$ – (off to the side write what $u$ = ???)
2. Factor in $u$
3. Replace $u$ with what it equals in terms of the middle variable

### Examples

Factor

1. $x^4 - 8x^2 - 48$
2. $a^2b^2 + 5ab - 36$

## To factor the difference of two squares and perfect-square trinomials

### Difference of two Perfect Squares:

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

- First term is a perfect square: $a^2$
- Second term is a perfect square: $b^2$
- Has a minus sign between the terms.

### Examples

Factor:

1. $x^2 - 100$
2. $25x^2 - 16$
3. $x^6 - 324$

## Perfect-square Trinomials:

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

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

- First term is a perfect square: $a^2$
- Third term is a perfect square: $b^2$
- Second term is twice the product of $a$ and $b$: $2ba$

*ALWAYS PAY ATTENTION TO SIGNS*

### Examples

Factor

1. $y^2 - 8y + 16$
2. $25x^2 + 60xy + 36y^2$

## To factor the sum or difference of two perfect cubes

A perfect cube is a number that has the same three factors.

### Sum or Difference of Two Perfect Cubes

First term is a perfect cube: $a^3$ Second term is a perfect cube: $b^3$

$$\boldsymbol{a^3 + b^3 = (a + b)(a^2 - ab + b^2)}$$
$$\boldsymbol{a^3 - b^3 = (a - b)(a^2 + ab + b^2)}$$

*ALWAYS PAY ATTENTION TO SIGNS*

### Examples

Factor

1. $x^3 + 64$ 2. $r^3 - 27m^3$

## To factor completely

### Factoring Checklist

1. Always check for a Greatest Common Factor.
2. Count the number of terms:
   - 4 terms – factor by grouping
   - 3 terms – check if it is a perfect-square trinomial, trinomial with "a", trinomial without "a"
   - 2 terms – difference of two squares or sum/difference of two cubes
3. Make sure each factor is completely factored.

### Examples

Factor completely

1. $x^4 - 7x^3 + 10x^2$ 2. $x^3 + x^2 - 4x - 4$ 3. $x^4 - 81$