

Review of Factoring

Basic Factoring Strategy:

- ① GCF
- ② Count the number of terms

a) 2 terms (special cases)

$$a^2 + b^2 \quad \text{Does not factor}$$

$$a^2 - b^2 = (a+b)(a-b)$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

b) 3 terms

"FOIL" factoring or
AC method

c) 4 terms

Grouping

AC method

→ manipulates the expression so that it can be factored using grouping

$$\underline{ax^2 + bx + c}$$

Example

$$9x^2 - 27x - 10$$

$$ac = (9)(10) = 90$$

subtracting to get
-27

90	1
45	2
-30	3
-27	-10

$$9x^2 - 27x - 10$$

$$9x^2 - 30x + 3x - 10$$

$$3x(3x - 10) + (3x - 10)$$

$$(3x - 10)(3x + 1)$$

Recall

$$ax^2 + bx + c$$

↑
+ → add
- → subtr

"FOIL" factoring

$$ax^2 + bx + c$$

↑
+ → add
- → subtracting

watch out for:

- * a & c are perfect squares
- * you missed a GCF
- * Is the middle term missing?

hint: you usually use the closest together factors

Examples

① $4x^2 - 9$

difference squares

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

② $x^3 - 64$

difference cubes

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

$$(a - b)(a^2 + ab + b^2)$$

$$a = x \quad b = 4$$

③ $4x^2 + 28x + 49$

↓
 $2x \cdot 2x$

↓
 $7 \cdot 7$

notice that $4x^2$ & 49 are perfect squares

$$(2x + 7)(2x + 7)$$

Be sure to check your middle term

$$(2x + 7)(2x + 7)$$

$14x$

④

$$x^2 - 7x - 30$$

$x \cdot x$ (pointing to x^2)
 Subtract (pointing to $-7x$)
 $30 \cdot 1$
 $10 \cdot 3$
 $15 \cdot 2$
 $5 \cdot 6$

no GCF
3 terms

If a is 1, you can use a "shortcut" AC method

$ac = (1)(30)$

30	1	29
15	2	13
10	3	7
6	5	1

1st try $(x \quad 5)(x \quad 6)$
 $5x - 6x \neq -7x$

2nd try $(x - 10)(x + 3)$
 $-10x + 3x = -7x$

⑤ $12x^2 - 17x + 6$

no GCF
3 terms

$12 \cdot 1$
 $6 \cdot 2$
 $4 \cdot 3$ (Start here →)
 add (pointing to $-17x$)
~~negatives~~
 $6 \cdot 1$
 $3 \cdot 2$ (← start here)

$(4x - 3)(3x - 2)$

check: $-8x - 9x = -17x$

recall: neither of your new factors can have a GCF if the original does not

⑥ $-a^3b^2 + 2a^2b^2 - ab^2$

gcf = $-ab^2$

$-ab^2(a^2 - 2a + 1)$

$-ab^2(a - 1)(a - 1)$

$-ab^2(a - 1)^2$

← 3 terms perfect squares on the ends

$$\textcircled{7} \quad x^3 - x^2 + 9x - 9$$

$$x^2(x-1) + 9(x-1)$$

$$\boxed{(x-1)(x^2+9)}$$

no GCF
4 terms
 \Rightarrow grouping

$$\textcircled{8} \quad x^4 - x^2 - 12 \quad \begin{matrix} \nearrow 6 \cdot 2 \\ \textcircled{4 \cdot 3} \\ \text{subtract} \end{matrix}$$

$$(x^2 - 4)(x^2 + 3)$$

$$\boxed{(x+2)(x-2)(x^2+3)}$$

no gcf
3 terms

you can factor again
(only the x^2-4 though)

$$\textcircled{9} \quad 32a^5 - 2a$$

$$\text{gcf} = 2a$$

$$2a(16a^4 - 1) \leftarrow \text{diff perfect squares}$$

$$2a(4a^2+1)(4a^2-1)$$

$$\boxed{2a(4a^2+1)(2a+1)(2a-1)}$$

Also recall when SOLVING, set each factor to zero. Your answer will be a number(s), not an expression:

Example:

$$x(x-6)(2x+1) = 0$$

$$\boxed{x=0}$$

$$x-6=0$$

$$\boxed{x=6}$$

$$2x+1=0$$

$$2x = -1$$

$$\boxed{x = -\frac{1}{2}}$$