

9/24/18

### Techniques in Factoring Polynomials

1. Always factor out the largest common factor first

$$\text{Ex: } 6n^3 + 24n^2 + 12n = 6n(n^2 + 4n + 2)$$

$$\text{Ex: } a(b-2) + c(b-2) = (b-2)(a+c)$$

$$\text{Ex: } 18a^2b - 15ab^2 = 3ab(6a - 5b)$$

2. Consider factoring by grouping—look for 4 terms

a) group the terms into pairs

b) factor out the common factor

c) factor out common binomial

$$\text{Ex: } 2x^3 - 3x^2 + 6x - 9$$

$$2x^3 - 3x^2 + 6x - 9$$

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

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

$$\text{Ex: } a^3 - 3a^2 - 2a + 6$$

$$\text{Ex: } m^2 - 4 = (m+2)(m-2)$$

$$\text{Ex: } 16x^2 - 9 = (4x + 3)(4x - 3)$$

$$\text{Ex: } 4xy^2 - 4xz^2 = 4x(y^2 - z^2) = 4x(y + z)(y - z)$$

$$\text{Ex: } 16x^2 - 25z^2 = (4x + 5z)(4x - 5z)$$

$$\text{Ex: } a^4 - 36 = (a^2 + 6)(a^2 - 6)$$

$$\text{Ex: } a^{10} - 100 = (a^5 + 10)(a^5 - 10)$$

$$\text{Ex: } a^{24} - 121 = (a^{12} + 11)(a^{12} - 11)$$

Exponents even  $\rightarrow$  perfect square

$$\text{Ex: } 4a^2b^4c^6 - 9 = (2ab^2c^3 + 3)(2ab^2c^3 - 3)$$

$$\begin{aligned} \text{Ex: } x^4 - 16 &= (x^2 + 4)(x^2 - 4) \\ &= (x^2 + 4)(x + 2)(x - 2) \end{aligned}$$

$$\text{Ex: } 4x^2 + 25 = (2x - 5)(2x - 5)$$

$$\text{Ex: } 4x^2 + 25 = \underline{\text{Prime}}$$

Sum of squares is Prime

## Sum and Difference of Cubes

$$x^3 + 8 = (x + 2)(x^2 - 2x + 4)$$

$$x^3 - 8 = (x - 2)(x^2 + 2x + 4)$$

↓            ↓  
Same      opposite

$$\text{Ex! } 27x^3 - 64 = (3x - 4)(9x^2 + 12x + 16)$$

↓            ↓  
(3x)      (4)