

17.1 Factors of Polynomials

Factoring with GCF

$$\text{Ex \#1 } 4x^3 + 2x^2 - 6x$$

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

$$\begin{array}{ccc} & -6 & \\ \textcircled{\frac{3}{2}} & \times & \textcircled{\frac{-2}{2}} \\ & 1 & \\ & & = \textcircled{-1} \end{array}$$

$$= \boxed{2x(2x+3)(x-1)}$$

$$\text{Ex \#2 } 7x^4 + 21x^3 - 14x^2$$

$$= \boxed{7x^2(x^2 + 3x - 2)}$$

$\begin{array}{ccc} & -2 & \\ & \times & \\ & 3 & \\ \text{cannot factor} & & \\ \text{any more} & & \end{array}$

$$\text{Ex \#3 } x^2(x-3) + 2x(x-3) - 3(x-3)$$

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

$$= \boxed{(x-3)(x+3)(x-1)}$$

$$\begin{array}{ccc} & -3 & \\ 3 & \times & -1 \\ & 2 & \end{array}$$

Factoring by Grouping

$$\text{Ex \#4 } 3x^2 - 8x - 3$$

$$\begin{array}{ccc} & -9 & \\ -9 & \times & 1 \\ & -8 & \end{array}$$

$$= \underline{3x^2 - 9x + 1x - 3}$$

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

$$= \boxed{(x-3)(3x+1)}$$

$$\text{Ex \#5 } 2x^2 + 7x + 6$$

$$\begin{array}{ccc} & 12 & \\ 3 & \times & 4 \\ & 7 & \end{array}$$

$$= \underline{2x^2 + 3x + 4x + 6}$$

$$= x(2x+3) + 2(2x+3)$$

$$= \boxed{(2x+3)(x+2)}$$

$$\text{Ex \#6 } 2x^3 + 10x^2 - 3x - 15$$

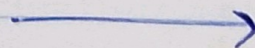
$$= 2x^2(x+5) - 3(x+5)$$

$$= \boxed{(x+5)(2x^2 - 3)}$$

$$\text{Ex \#7 } 4x^4 + 7x^3 + 4x + 7$$

$$= x^3(4x+7) + 1(4x+7)$$

$$= \boxed{(4x+7)(x^3+1)}$$



Sum and Difference of Cubes

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2) \leftarrow \text{addition}$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2) \leftarrow \text{subtraction}$$

$$\text{Ex \#8 } x^3 - 8$$

$$= x^3 - 2^3$$

$$= \boxed{(x-2)(x^2 + 2x + 4)}$$

cannot factor more \rightarrow ~~$\frac{4}{2}$~~

$$\text{Ex \#9 } x^3 + 27$$

$$= x^3 + 3^3$$

$$= \boxed{(x+3)(x^2 - 3x + 9)}$$

cannot factor more \rightarrow ~~$\frac{9}{-3}$~~

$$\text{Ex \#10 } 8x^3 - 64$$

$$= 8(x^3 - 8)$$

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

$$= \boxed{8(x-2)(x^2 + 2x + 4)}$$

$$\text{Ex \#11 } 27 + 125x^3$$

$$= 3^3 + (5x)^3$$

$$= \boxed{(3+5x)(9 - 15x + 25x^2)}$$

cannot factor more \rightarrow ~~$\frac{225}{-15}$~~