2-3 Factoring Polynomials

(Book 6.4 pg. 353-)

Objectives:

- I can factor a polynomial by GCF, special factoring, and factor by grouping
- I can find multiple representations of factored polynomials

Factor the following:

$x^2 - 7x + 10$

$2x^2 - 3x - 2$

Greatest Common Factors pg. 355-356

(A) $6x^3 + 15x^2 + 6x$

$6x^3 + 15x^2 + 6x$	Write out the polynomial.
$x(6x^2 + 15x + 6)$	Factor out a common monomial, an x.
$3x(2x^2 + 5x + 2)$	Factor out a common monomial, a 3.
$x(2x + 1)(x + 2)$	Factor into simplest terms.

Note: The second and third steps can be combined into one step by factoring out the greatest common monomial.

(B) $2x^3 - 20x$

$\_\_\_\_^3 - \_\_\_\_x$	Write out the polynomial.
$\_\_\_\_(x^2 - 10)$	Factor out the greatest common monomial.

Factor.

$$3x^3 + 7x^2 + 4x$$

$$4a^4b + 8a^3b^3 - 10a^2b^4$$

Special Factoring Patterns pg. 355

Remember the factoring patterns you already know:

Difference of two squares: $a^2 - b^2 = (a-b)(a+b)$

Perfect square trinomials: $a^2 + 2ab + b^2 = (a+b)^2$

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

There are two other factoring patterns that will prove useful:

Sum of two cubes: $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Difference of two cubes: $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Factor.

$x^3 - 27$

$27x^3 + 64$

$8x^3 + 64$

$x^3 + 4$

$4x^2 - 36$

Factoring by Grouping pg. 357

(A) $x^3 + x^2 + x + 1$

Write out the polynomial.	$x^3 - x^2 + x - 1$
Group by common factor.	$(x^3 - x^2) + (x - 1)$
Factor.	$x^2(x - 1) + 1(x - 1)$
Regroup.	$(x^2 + 1)(x - 1)$

(B) $x^4 + x^3 + x + 1$

$x^3 - \#$

$x^3 + \#$

$2 \cdot 3$

$3 \cdot 2$

$a = x$

$b = 1$

Write out the polynomial.	$x^4 + x^3 + x + 1$
Group by common factor.	$(x^4 + x^3) + (x + 1)$
Factor.	$x^3(x + 1) + 1(x + 1)$
Regroup.	$\boxed{(x^3 + 1)}(x + 1)$
Apply sum of two cubes to the first term.	$(x^2 - x + 1)(x + 1)(x + 1)$
Substitute this into the expression and simplify.	$(x+1)^2(x^2 - x + 1)$

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

$x^3 + 1\#$

Factor by Grouping.

$$x^3 + 3x^2 + 3x + 2$$

$$x^2(x+3) + 1(3x+2)$$

$\boxed{\text{Irreducible}}$

$$x^3 - 3x^2 + x - 3$$

$$x^2(x-3) + 1(x-3)$$

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

$$x^2 + 0x + 1$$

$1 \quad 1$

9. $10x^3 - 80$

$x^3 - \# \quad x^3 + \#$

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

$10(x^3 - 8)$ $a = x$

$b = 2$

$$\boxed{10(x-2)(x^2+2x+4)}$$

10. $x^2(2x^2+7x+5)$

$2 \cdot 5 = 10$

$2 \quad 5$

$x^2[2x^2+2x+5x+5]$