$(a+b)^4 \leftarrow n$

n decrease 1
0 increase 1

$1a^4\cancel{b^0} + 4a^3b^1 + 6a^2b^2 + 4a^1b^3 + 1\cancel{a^0}b^4$

$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

1 4 6 4 1

3. $(x-5)^4$ $a = x$ $b = -5$ $n = 4$

$1(x)^4(-5)^0 + 4(x)^3(-5)^1 + 6(x)^2(-5)^2$
$+4(x)^1(-5)^3 + 1(x)^0(-5)^4$

$1(x^4)(1) + 4(x^3)(-5) + 6(x^2)(25)$
$+4(x)(-125) + 1(1)(625)$

$\boxed{x^4 - 20x^3 + 150x^2 - 500x + 625}$

1 5 10 10 5 1 4. $(3x+4)^5$ $a=3x$ $b=4$ $n=5$

$$1(3x)^5(4)^0+5(3x)^4(4)^1+10(3x)^3(4)^2+$$
$$10(3x)^2(4)^3+5(3x)^1(4)^4+1(3x)^0(4)^5$$
$$1(243x^5)(1)+5(81x^4)(4)+10(27x^3)(16)+$$
$$10(9x^2)(64)+5(3x)(256)+1(1)(1024)$$

$$\boxed{243x^5+1620x^4+4320x^3+5706x^2+3840x+1024}$$

1 6 15 20 15 6 8. $(4x+3y)^6$ $a=4x$ $b=3y$ $n=6$

$$1(4x)^6(3y)^0+6(4x)^5(3y)^1+15(4x)^4(3y)^2$$
$$+20(4x)^3(3y)^3+\boxed{15(4x)^2(3y)^4}+6(4x)^1(3y)^5$$
$$+1(3x)^0(3y)^6$$

$$15(16x^2)(81y^4)$$

$$19440x^2y^4$$

$$(3x)^5 = 3x \cdot 3x \cdot 3x \cdot 3x \cdot 3x$$

$$3^5 x^5$$

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

$a=1 \rightarrow$ shortcut

Factor the following:

$1 \cdot 10 = 10$

$-2 \quad -5$

$1 \quad 10$

$1x^2 - 7x + 10$

$\boxed{(x-2)(x-5)}$

$x^2 - 2x - 5x + 10$

$x(x-2) - 5(x-2)$

$\boxed{(x-2)(x-5)}$

$2 \cdot -2 = -4$

$2 \quad 2$

$+1 \quad -4$

$2x^2 \boxed{-3}x - 2$

$2x^2 + x - 4x - 2$

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

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

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.
$\boxed{3x(2x+1)(x+2)}$	Factor into simplest terms.

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

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

$2x^3 - 20x$	Write out the polynomial.
$\boxed{2x(x^2 - 10)}$	Factor out the greatest common monomial.

$x^2 + 0x - 10 \qquad 1(-10) = -10$

$2 \cdot 2 = 4$

$1 \quad 4$

$2 \quad 2$

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

$3x[2x^2+x+4x+2]$

$3x[x(2x+1)+2(2x+1)]$

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

Factor.

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

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

12

$1 \cdot 12$

$\cancel{2 \cdot 6}$

$3 \cdot 4$

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

$x[3x^2+3x+4x+4]$

$x[3x(x+1)4(x+1)]$

$x[(x+1)3x+4)$

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

$6x^2+3x+9$

$\boxed{3[2x^2+x+3]}$

$2 \cdot 6 = 6$

1 6

-2 +3

-6

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

a =

b =

Factor.

$(3x)^2$

$\sqrt[3]{x^3} - \sqrt[3]{27}$

$a = x \quad b = 3$

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

$27x^3 + 64$

$a = 3x \quad b = 4$

$(3x+4)(9x^2-12x+16)$

$8x^3 + 64$

$8(x^3+8)$

$a = x \quad b = 2$

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

$x^3 + 4$

$a = x \quad b =$

$\boxed{\text{irreducible}}$

$4x^2 - 36$

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 $x^4 + x^3 + x + 1$

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

Factor by Grouping.

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

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