MATH 1010 ~ Intermediate Algebra   Chapter 5: POLYNOMIALS AND FACTORING

Section 5.5: Factoring Trinomials

Objectives:

✴ Recognize and factor perfect square trinomials.
✴ Factor Trinomials of varying forms.
✴ Factor polynomials using guidelines for factoring.

$x^2 - 6x + 9 = ($ $)($ $)$

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

$6x^3 + 27x^2 - 15x = ($ $)($ $)$

<u>Perfect Square Trinomials</u>

① $u^2 + 2uv + v^2 = (u+v)^2$ $(u+v)^2 = (u+v)(u+v)$

② $u^2 - 2uv + v^2 = (u-v)^2$ $= u^2 + uv + uv + v^2$

① EXAMPLES:

a) $x^2 - 4x + 4 = x^2 - 2(2x) + 2^2$ ②
   $= (x-2)^2$ $x = u$
   $2 = v$

b) $9x^2 - 30xy + 25y^2 = (3x)^2 - 2(15xy) + (5y)^2$
   ②
   $u = 3x$ $= (3x - 5y)(3x - 5y)$
   $v = 5y$ $= (3x - 5y)^2$

c) $16x^3 + 80x^2 + 100x$

   $= 4x(4x^2 + 20x + 25)$
   ①
   $u = 2x$ $= 4x((2x)^2 + 2(10x) + 5^2)$
   $v = 5$ $= 4x(2x + 5)^2$

② EXAMPLE: Guess & Test
   Factor these.

a) $x^2 - x - 20$

$= (x - 2)(x + 10)$ $8x \neq -x$

$(x - 4)(x + 5)$ $-4x + 5x = x \neq -x$

$\boxed{(x + 4)(x - 5)}$

b) $x^2 - 17x - 18$

$= (x - 18)(x + 1)$

c) $x^2 + 5x + 4$

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

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

③ EXAMPLE:

Factor these.

a) $4x^2 + 5x - 6$

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

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

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

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

b) $2x^2 - x - 3$

$2 \cdot -3 = -6$ $-x = 2x - 3x$

$-1, 6$ $(x + 1)(2x - 3)$

$-6, 1$

$-2, 3$

$2, -3$

	$2x$	-3
x	$2x^2$	$-3x$
1	$2x$	-3

c) $6x^2 + 19x + 10$

$6 \cdot 10 = 60$

$1, 60$

$2, 30$

$3, 20$

$4, 15$

$19x = 4x + 15x$

	$2x$	5
$3x$	$6x^2$	$15x$
2	$4x$	10

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

④ EXAMPLE:
   Factor these.

a) $-3x^2 + 16x + 35$

$= -(3x^2 - 16x - 35)$

$3 \cdot -35 = -105$

$-3 \cdot 35$

$3 \cdot -35$

$5 \div 2$

$-16x$

$= 5x - 21x$

	X	-7
3x	$3x^2$	$-21x$
5	$5x$	-35

$= -(3x+5)(x-7)$

or $(-3x-5)(x-7)$

b) $4x^3 - 32x^2 + 64x$

$= 4x(x^2 - 8x + 16)$

$= 4x(x-4)(x-4)$

or $4x(x-4)^2$

c) $x^3 - 3x^2 - 4x + 12$

$= (x^3 - 3x^2) - (4x - 12)$

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

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

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