Simple Trinomials

Ex/ Given $y = 2x^2 - 6x$, determine the vertex and the zeros.

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

$$X = \frac{6}{2(2)} = \frac{6}{4} = 1.5$$

Vertex $(1.5, -4.5)$

Zeros: $(0,0), (3,0)$

$$y = 2(1.5)^2 - 6(1.5)$$
$$= -4.5$$

- Common factoring is helpful in simplifying an equation, and determining the a value, but it is only really the first step in finding the zeros.

- Since most quadratic functions in standard form have 3 terms: $y = ax^2 + bx + c$, this type of factoring isn't always going to be enough. However, if we examine what happens when we FOIL, you may notice a pattern.

Ex/ Expand $y = (x+2)(x+3)$ and $y = 2(x+1)(x-3)$

$$= x^2 + 3x + 2x + 6 \qquad = 2(x^2 - 3x + 1x - 3)$$

$$= x^2 + 5x + 6 \qquad = 2(x^2 - 2x - 3)$$

$$\nearrow \quad \uparrow \qquad\qquad \nearrow \quad \uparrow$$

$$2+3 \qquad 2(3) \qquad 1+(-3) \qquad 1(-3)$$

- When we expand a pair of brackets, we usually get a trinomial (3 terms). Sometimes there is a value in front of the x^2 term that can be common factored or sometimes there is simply an x^2 term. For this reason these expressions are called simple trinomials.

- To factor a simple trinomial:
   1) First check for a common factor (make it simpler).
   2) Then have to find two values that: ADD to the MIDDLE and MULTIPLY to the END.

Ex/ Factor.   Add   multiply
   a) $x^2 + 7x + 12$ b) $x^2 + 7x + 10$ c) $x^2 - 2x - 24$

   $= (x+3)(x+4)$ $= (x+2)(x+5)$ $= (x-6)(x+4)$

   $\uparrow \quad \uparrow$
   order does not matter

   $3+4 = 7$ $2+5 = 7$ $-6+4 = -2$
   $3(4) = 12$ $2(5) = 10$ $-6(4) = -24$

d) $x^2 - 14x + 48$

$= (x-6)(x-8)$

e) $x^2 + 10x + 9$

$= (x+9)(x+1)$

f) $x^2 + 8xy + 15y^2$

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

$x(5y) + 3y(x) = 8xy$

$3y(5y) = 15y^2$

g) $\overset{a}{2}x^2 - 4x - 16$

✱ Common factor first if $a \neq 1$

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

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

h) $3x^3 - 9x^2 - 84x$

$= 3x(x^2 - 3x - 28)$

$= 3x(x-7)(x+4)$

i) $-2x^2 - 6x + 20$

when common factoring try to make x^2 positive

$= -2(x^2 + 3x - 10)$

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

j) $x^4 + 7x^2 - 18$

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

↖ ↗

half of x^4

Ex/ Given $y = -x^2 - 2x + 3$, state:
   a) The direction of opening.
   b) The zeros.
   c) The y-intercept.
   d) The vertex.

a) opens down $(a = -1)$

b) $y = -1(x^2 + 2x - 3)$

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

zeros: $(-3, 0), (1, 0)$

or average zeros

c) $x = 0, \quad y = -(0)^2 - 2(0) + 3$

$= 3$

d) $x = \dfrac{2}{2(-1)} = -1 \qquad y = -(-1)^2 - 2(-1) + 3$

$= 4$

Vertex $= (-1, 4)$

Homework: Pg. 212   #'s: 7, 9, 12, 13ab, 16ab, 19ab