Factoring Complex Trinomials

A complex trinomial... is a trinomial of the form

$$ax^2 + bx + c \quad \text{where} \quad a \neq 1.$$

[Sometimes we can find a GCF to help us factor complex trinomials.]

Examples:

a) $y = 5x^2 + 10x - 15$

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

$= 5(x + 3)(x - 1)$

$\overset{\times}{} -3$
$\overset{+}{} 2$

b) $y = -4x^2 - 20x + 56$

$= -4(x^2 + 5x - 14)$

$= -4(x + 7)(x - 2)$

$\overset{\times}{} -14$
$\overset{+}{} 5$

Try these two on your own, or with your seat partners.

c) $y = 3x^2 + 12x - 15$

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

$= 3(x + 5)(x - 1)$

$\overset{\times}{} -5$
$\overset{+}{} 4$

d) $y = -2x^2 + 20x - 48$

$= -2(x^2 - 10x + 24)$

$= -2(x - 4)(x - 6)$

$\overset{\times}{} 24$
$\overset{+}{} -10$

Connecting Factoring With Graphing
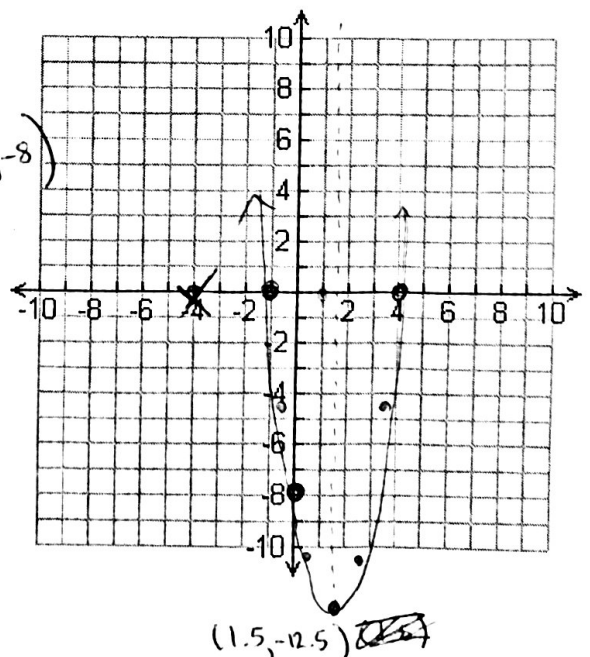
Consider the quadratic relation: $f(x) = 2x^2 - 6x - 8$

a) Where is the y-intercept for this relation? Plot it. $(0, -8)$

b) Factor this relation using our skills from today.

$y = 2x^2 - 6x - 8$

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

$= 2(x - 4)(x + 1)$

$(4, 0) \; \xi \; (-1, 0)$

$\overset{\times}{} -4$
$\overset{+}{} -3$

$(1.5, -12.5)$

c) Where are the zeros for this relation? Plot them.

d) Find the axis of symmetry and the vertex, and then complete the sketch of this relation.

$$AOS: \quad x = \frac{-1+4}{2} = 1.5$$

$$y = 2(1.5-4)(1.5+1)$$
$$= 2(-2.5)(2.5)$$
$$= -12.5$$

$$(1.5, -12.5)$$

e) State this quadratic relation in all three forms:

Standard Form	Factored Form	Vertex Form
$y = 2x^2 - 6x - 8$	$y = 2(x-4)(x+1)$	$y = 2(x-1.5)^2 - 12.5$

You try it: Convert the following relations into factored form by common factoring, then simple trinomial factoring. Make a sketch of each relation by plotting the y-intercept (if plottable), then the x-intercepts, and finally finding the vertex.

$$y = 3x^2 + 12x + 9$$

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

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

$\times$ 3
$+$ 4

$$AOS: \quad x = -2$$

$$y = 3(-2+1)(-2+3)$$
$$= 3(-1)(1)$$
$$= -3 \qquad \text{vertex } (-2, -3)$$