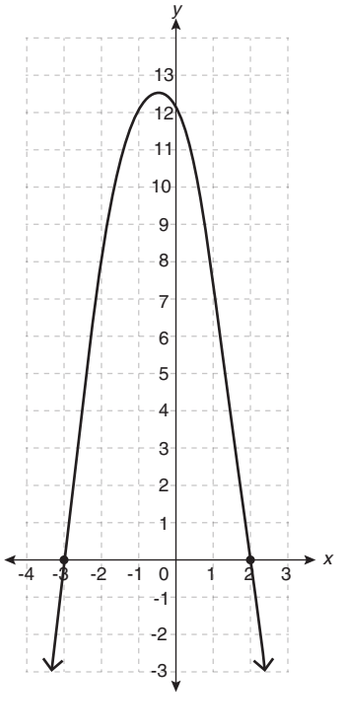
Unit 2: Quadratic Functions Lesson 2.2

Coach's Corner - III

Use the following graph to answer question 1:



1. a. Express the function in factored form as $f(x) = a(x - r)(x - s)$, given the graph and the fact that the GCF is $a = -2$.

You know $a = -2$ (given).
The graph has x-intercepts at -3 and 2. As such, the function will have factors of $(x + 3)$ and $(x - 2)$.
$f(x) = -2(x + 3)(x - 2)$

b. Determine the y-intercept.

The y-intercept can be determined by inspecting the graph or by evaluating the function when $x = 0$.

$f(0) = -2(0 + 3)(0 - 2)$
$f(0) = -2(3)(-2)$
$f(0) = 12$
$y - \text{intercept} = 12$

c. Express the equation of the function in standard form.

$f(x) = -2(x+3)(x-2)$
$f(x) = -2(x^2 + x - 6)$
$f(x) = -2x^2 - 2x + 12$

2. Consider the function $f(x) = 2x^2 - 3x - 9$.

a. Express the function in factored form.

Factor the trinomial.

$$\begin{aligned} f(x) &= 2x^2 - 3x - 9 \\ &= 2x^2 - 6x + 3x - 9 \\ &= (2x^2 - 6x) + (3x - 9) \\ &= 2x(x-3) + 3(x-3) \\ &= (x-3)(2x+3) \end{aligned}$$

b. Use the factored form to sketch the graph of the function.

Determine the x-intercepts.
Beginning with $f(x) = (x-3)(2x+3)$, the x-intercepts are found by setting each factor to zero.

$x - 3 = 0$ and $2x + 3 = 0$
$x = 3$ $2x = -3$
$x = -1.5$

Determine the equation of the axis of symmetry.

The axis of symmetry is halfway between the x-intercepts.

$$\frac{3 + (-1.5)}{2} = \frac{1.5}{2}$$
$$= 0.75$$

Determine the coordinates of the vertex.
The vertex is located on the axis of symmetry.

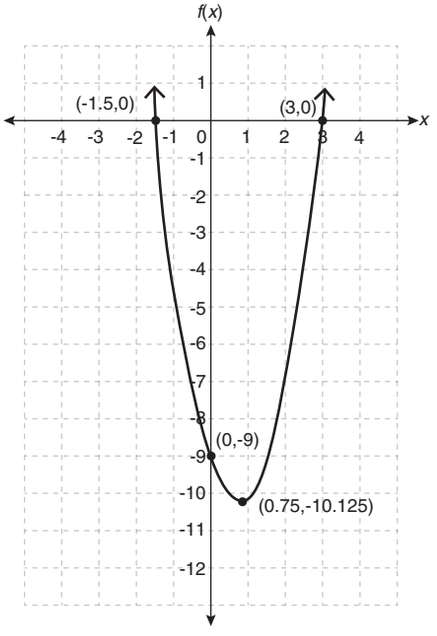
$$f(x) = (x-3)(2x+3)$$
$$f(0.75) = (0.75-3)(2(0.75)+3)$$
$$= -10.125$$

The vertex is at (0.75, –10.125).

Determine the y-intercept.

Since the function was originally given in standard form, $f(x) = 2x^2 - 3x - 9$, the y-intercept corresponds to the c-value, which is –9.

Use the vertex and the intercepts to draw the graph.



3. Complete the following table for the graph of $f(x) = -4(x-3)^2 + 7$ without actually graphing it.

y-intercept	–29
axis of symmetry	$x = 3$
vertex	(3,7)
domain	$\{x \mid x \in \mathrm{R}\}$
range	$\{y \mid y \leq 7, y \in \mathrm{R}\}$

The function is written in vertex form, so the vertex occurs at (h, k), which is $(3, 7)$.

The axis of symmetry passes through the vertex and so its equation is $x = 3$.

The y-intercept is equal to $f(0)$ and so is $f(0) = -4(0-3)^2 + 7 = -29$.

The a value is negative, so the parabola opens down and the y-coordinate of the vertex, 7, is the maximum y-value.