

§7-4 Factored Form of a Quadratic Function

x Relate the factors of a quadratic function to the characteristics of its graph.
 $y = a(x-r)(x-s)$

Example 1 (p383)

Sketch the graph of the quadratic function:

$f(x) = 2x^2 + 14x + 12$

(no table of values + calculator)

State the domain and range.

$f(x) = 2x^2 + 14x + 12$

$f(x) = 2(x^2 + 7x + 6)$

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

factored form $\rightarrow (f(x) = a(x-r)(x-s))$

Find the x-intercepts (zeros) by setting equal to 0.

$0 = 2(x+6)(x+1)$

Set each factor equal to zero + solve for x:

$x+6=0$

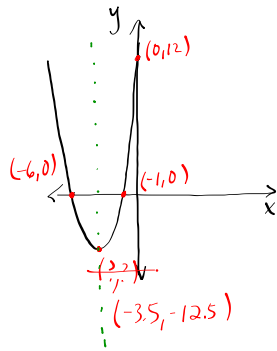
$x+1=0$

$x = -6$ roots / zeros / x-intercepts $x = -1$

$(-6, 0)$

$(-1, 0)$

The y-intercept is c ($ax^2 + bx + c$)
 so the y-intercept is 12 or the point $(0, 12)$



We still need to locate the vertex.

$x = \frac{-6 + (-1)}{2}$

(halfway b/w the x-intercepts)

$x = -3.5$

$f(-3.5) = 2(-3.5)^2 + 14(-3.5) + 12$

$f(-3.5) = -12.5$

vertex $(-3.5, -12.5)$

When sketching a graph of a quadratic:

- ① x-intercepts
- ② y-intercept
- ③ vertex / axis of symmetry

domain: $\{x | x \in \mathbb{R}\}$

range: $\{y | y \in \mathbb{R}, y \geq -12.5\}$

Example 2 - Partial factoring

Sketch the graph of the following quadratic function:

$$f(x) = x^2 + 6x + 10 \quad -(x^2 - 6x - 10)$$

State the domain + range

factor this part

$$f(x) = -x(x-6) + 10$$

Set equal to zero

Set each factor equal to zero

$$-x(x-6) = 0$$

$$-x = 0$$

$$x = 0$$

point (0, 10)

$$x - 6 = 0$$

$$x = 6$$

point (6, 10)

these points have the same y-value.

The vertex is located half way between.

vertex: $x = \frac{0+6}{2}$
 $x = 3$

$$(3, 19)$$

$$f(x) = -x^2 + 6x + 10$$

$$f(3) = -(3)^2 + 6(3) + 10$$

$$f(3) = -9 + 18 + 10$$

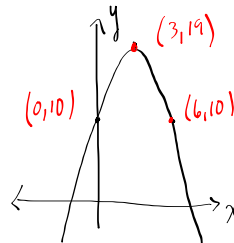
$$f(3) = 19$$

points: $(0, 10), (6, 10)$

vertex: (3, 19)

y-intercept: (0, 10)

graph opens down.



domain: $\{x \mid x \in \mathbb{R}\}$

range: $\{y \mid y \in \mathbb{R}, y \leq 19\}$

If the quadratic factors easily:

Example 1

- ① Set equal to zero to find x-intercepts.
- ② find vertex (halfway between x-intercepts)
- ③ find y-intercept

If the quadratic doesn't factor easily, we partial factoring

Example 2

- ① set first part equal to zero to find two points with same y-value
- ② find the vertex (halfway between two points)
- ③ find y-intercept.

Example 3 - Find the equation from the graph.

Determining the equation of a quadratic function, given its

tion that defines this parabola. Write the function in

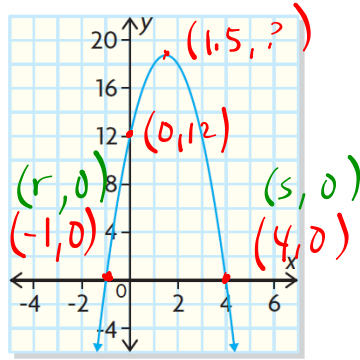
factored form
 $y = a(x-r)(x-s)$

r and s are
 the x -intercepts

$$x = \frac{-1+4}{2}$$

$$x = \frac{3}{2}$$

$$x = 1.5$$



$$y = a(x - (-1))(x - 4)$$

sub in values for
 the x -intercepts.

$$y = a(x+1)(x-4)$$

In order to find a , we need a point (x, y)
 to sub in. Do not use the x -intercepts.

use $(0, 12)$

$$12 = a(0+1)(0-4)$$

$$12 = a(1)(-4)$$

$$12 = a(-4)$$

$$a = -3$$

$$y = -3(x+1)(x-4)$$

To Do:

① C4U (p391)

② p391 | 4-13

Read Summary
 p390