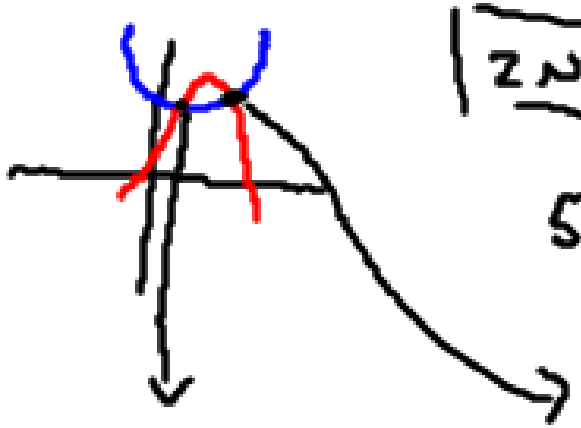
EXAMPLE 3 Solving a quadratic equation in non-standard form

Determine the roots of this quadratic equation. Verify your answers.

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

$Y_1 = 3x^2 - 6x + 5$

$Y_2 = 8x - 2x^2$



2ND TRACE

5: intersect

x2

$x = 2.38$

$\rightarrow x = 0.42$

$3(0.42)^2 - 6(0.42) + 5 = 2(0.42)(4 - 0.42)$

$0.5292 - 2.52 + 5 = (0.84)(3.58)$

$3.0092 = 3.0072$ ✓

5a, 6a, 10, 13a

7.4 Factored Form of a Quadratic Function

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

x-int $(r, 0)$, $(s, 0)$

$0 = a(x - r)(x - s)$ general

$x - r = 0$ $\quad$ $x - s = 0$

$x = r$ $\quad$ $x = s$

$0 = 2(x + 3)(x - 2)$ ex/ with #'s

$x + 3 = 0$ $\quad$ $x - 2 = 0$

$x = -3$ $\quad$ $x = 2$

roots

$y = ax^2 + bx + c$

① Is there anything common?

② What factors multiply to give 'c' and add to give 'b'

$x \in R$ $\quad$ $y \geq -12.5, y \in R$

EXAMPLE 1 Graphing a quadratic function given in standard form

Sketch the graph of the quadratic function:

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

State the domain and range of the function.

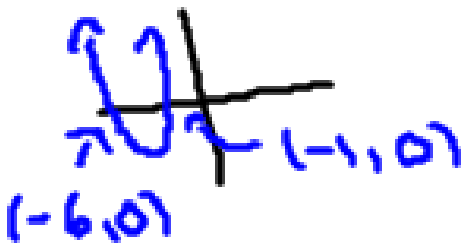
$y = 2(-3.5)^2 + 14(-3.5) + 12$

$y = -12.5$

vertex

2 points at same height

find roots.



$y = 2x^2 + 14x + 12$

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

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

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

$x = -1 \quad x = -6$

vertex:

$x = \frac{-1 + -6}{2} = -3.5$

$(-3.5, -12.5)$

MCR.

p. 398 #7

$h(t) = -4.9t^2 + 10t + 828$

$h(t) = 0$

$0 = -4.9t^2 + 10t + 828$

$y_1 = -4.9t^2 + 10t + 828$

GDC $t = 14.1$ s

2ND TRACE

ZERO

EXAMPLE 2 Using a partial factoring strategy to sketch the graph of a quadratic function

Sketch the graph of the following quadratic function:

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

State the domain and range of the function.

$x \in R$

(3, 19)

vertex

two points at same height

$y = -x^2 + 6x + 10$

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

if $x = 0$ $\quad x = 6$

(0, 10) $\quad$ (6, 10)

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

$y = -3(3 - 6) + 10$

$y = +9 + 10$

$y = 19$

(3, 19) vertex

$y \leq 19, y \in R$

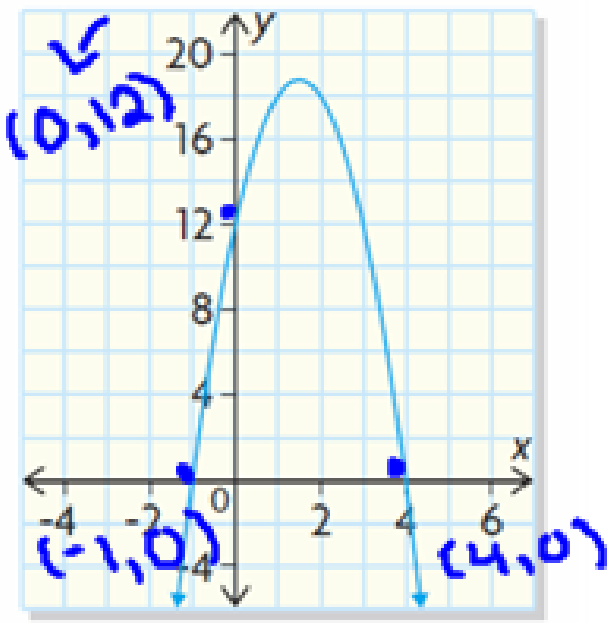
EXAMPLE 3 Determining the equation of a quadratic function, given its graph

Determine the function that defines this parabola. Write the function in standard form.

$y = ax^2 + bx + c$

Factored form

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



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

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

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

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

$\frac{12}{-4} = \frac{-4a}{-4}$ $\quad a = -3$

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

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

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

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

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

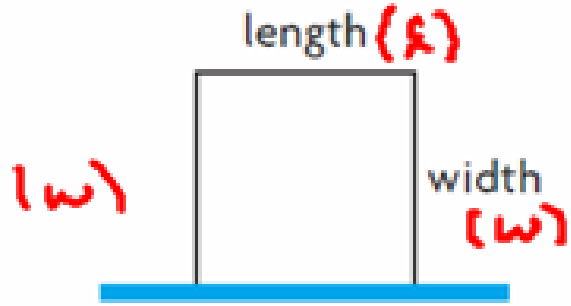
EXAMPLE 4 Solving a problem modelled by a quadratic function in factored form

Lamont runs a boarding kennel for dogs. He wants to construct a rectangular play space for the dogs, using 40 m of fencing and an existing fence as one side of the play space.

$A = l \cdot w$

$40 = l + 2w$

$l = 40 - 2w$



y

$* \; A = (40 - 2\overset{x}{w})\overset{x}{w}$

a) Write a function that describes the area, A, in square metres, of the play space for any width, w, in metres.

$A = 40w - 2w^2$

Determine the maximum total area.

b)

$y = (40 - 2x)x$

$0 = (40 - 2x)x$

$x = 0$

$0 = 40 - 2x$

$-40 = -2x$

$20 = x$

$A = (40 - 2w)w$

zeros/roots/x-int

$x = 20$

$w = 20$

$x = 0$

$w = 0$

vertex

$$x = \frac{20 + 0}{2} = 10$$

$w = 10$

$A = (40 - 2(10))(10)$

$A = (40 - 20)(10)$

$A = (20)(10) = 200\ m^2$

p. 391-393 ... Do #1-3, 8, 9, 10 a,c,e, 11, 12