F Math 11 ***7.3 Solving Quadratic Equations by Graphing p. 373***

Quadratic Equation: is of the form $ax^2+bx+c=0$. To solve a quadratic equation means to find the x-intercepts

Zero: In a function, a value of the variable that makes the function equal to zero.

Example 1: Verifying solutions to a quadratic equation (p. 374)

The flight time for a long-distance water ski jumper depends on the initial velocity of the jump and the angle of the ramp. For one particular jump, the ramp has a vertical height of 5 m above water level. The height of the ski jumper in flight, $h(t)$, in metres, over time, t, in seconds, can be modelled by the following function:

$$h(t) = 5.0 + 24.46t - 4.9t^2$$

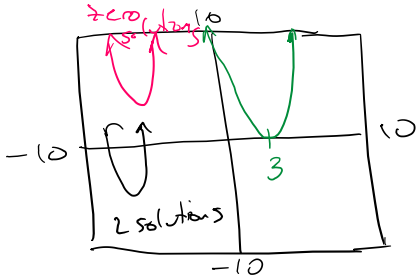
How long did the skier on the right hold his flight pose?

5.032 s

The skier holds his flight pose until he is 4.0 m above the water.

Roots: The values of the variable that make a standard form equation equal to zero, called solutions (also zeroes and x-ints)

Example 2: What are the roots for $x^2 - 6x + 9 = 0$?

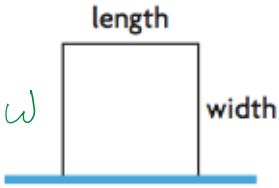


There is only one root

$x = 3$

Example 3: Graphing to determine the number of roots (p. 376)

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.



Perimeter

$P = 2w + l$

$40 = 2w + l$

$l = -2w + 40$

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

Area

$A = lw$

$= (-2w + 40)w$

$A = -2w^2 + 40w$

b) Write equations you could use to determine the widths for areas of 250 m^2, 200 m^2, and 150 m^2.

① ② ③

A A A

① $250 = -2w^2 + 40w$

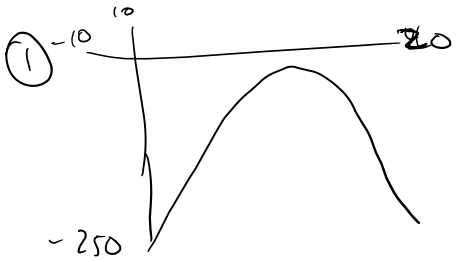
$0 = -2w^2 + 40w - 250$

② $200 = -2w^2 + 40w$

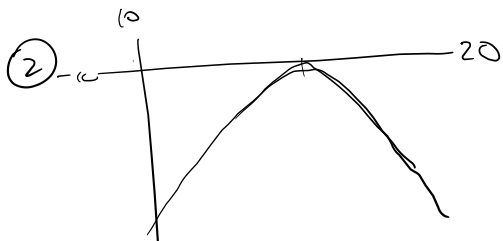
$0 = -2w^2 + 40w - 200$

③ $0 = -2w^2 + 40w - 150$

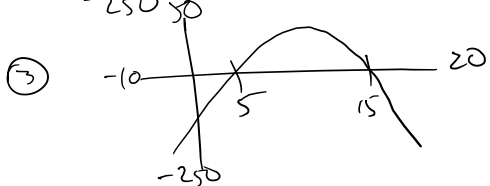
c) Determine the number of possible widths for each equation using a graph.

① 

No solutions, no x-intercepts, can't have 250 m^2 of play space.

② 

1 solution at $x = 10$ so width is 10 m

③ 

2 solutions at $x = 5$ and $x = 15$

when the width is 5 m or 15 m the area will be 150 m^2

Example 3: Solving a quadratic equation in non-standard form (p. 378)

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

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

$3x^2 - 6x + 5 = 8x - 2x^2$

$+2x^2 - 8x \qquad -8x + 2x^2$

$5x^2 - 14x + 5 = 0$

graph on calc
2nd calc to find both zeroes

$x = 0.42, \; x = 2.38$

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