§7-3 Solving Quadratics by Graphing (p373)

Investigation → height of rocket as a function of time.
→ When will the rocket be at 72m above the ground.

$$h(t) = -4.9t^2 + 68t$$

A. When the rocket is at eye level, $h(t) = 72$ m

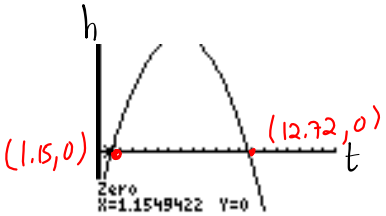
B. $72 = -4.9t^2 + 68t$

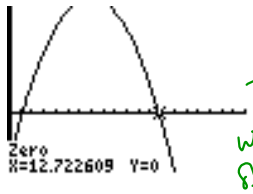
$0 = -4.9t^2 + 68t - 72$ (standard form)

$(y = ax^2 + bx + c)$

C. Graph $y = -4.9t^2 + 68t - 72$

and find the x-intercepts (or zeros)



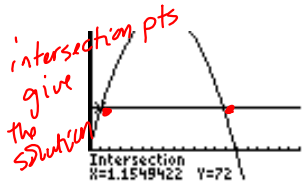


The rocket was at a height of 72m at 1.15s and 12.72s after take off

t-intercepts: 1.15 s and 12.72 s

D. Graph $h(t) = -4.9t^2 + 68t$

$h(t) = 72$



The curves intersect at

$x = 1.15$s and $x = 12.72$s

You get the same solution each time!

The solution represents the times when the rocket will be at 72m above the ground.

Example 1 (p374)

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

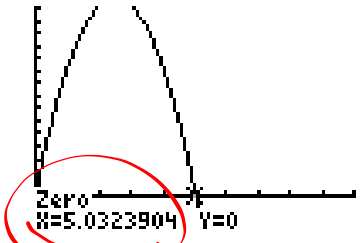
$4.0 = 5.0 + 24.46t - 4.9t^2$ ← the height of the waterski jumper

$$0 = 1.0 + 24.46t - 4.9t^2$$

$$(y = c + bx + ax^2)$$

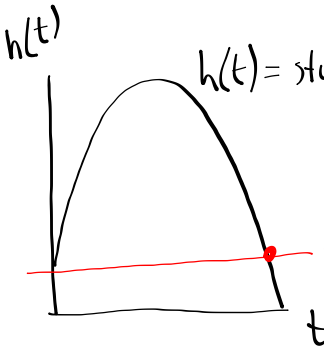
Graph: $y = 1.0 + 24.46t - 4.9t^2$

+ find the zeros (x-intercepts)



The ski jumper will be at a height of 4.0m 5.03 s after taking off

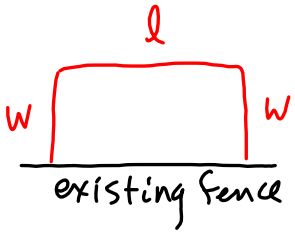
Alternatively, you could graph: $h(t) = 5.0 + 24.46t - 4.9t^2$ and $h(t) = 4.0$



and find the intersection pts.

Example 2 (p376)

What dimensions will give the maximum area?



only have 40m of new fencing

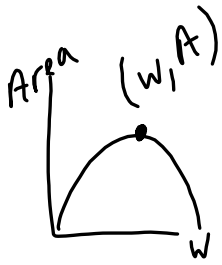
amount of fencing:

$40 = 2w + l \Rightarrow \boxed{l = 40 - 2w}$

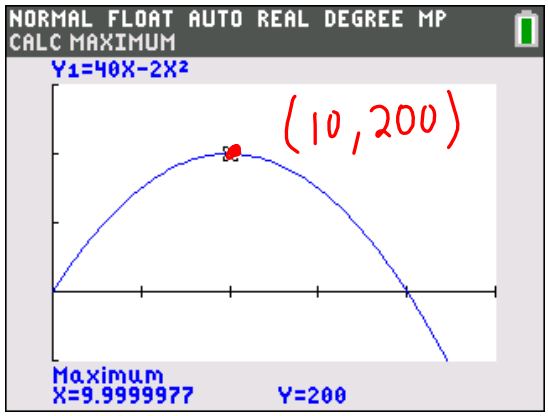
Area = wl

Area = $w(40 - 2w)$

Area = $40w - 2w^2$



graph $y = 40x - 2x^2$



A fence of width 10m and length of 20m will give a maximum area of 200 m^2.

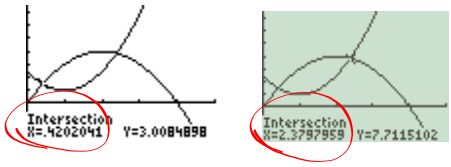
Example 3

Determine the roots of the quadratic equation:

$$\underbrace{3x^2-6x+5}_{f(x)} = \underbrace{2x(4-x)}_{g(x)}$$

Graph: $f(x) = 3x^2-6x+5$
$g(x) = 2x(4-x)$

+ find the intersection



The intersection points occur at $x = 0.4202$
$x = 2.3798$

Check:

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

$3(0.4202)^2-6(0.4202)+5 \stackrel{?}{=} 2(0.4202)(4-0.4202)$

$3.0085 \neq 3.0085$

Alternatively, rearrange into standard form.

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

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

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

Graph: $y = 5x^2-14x+5$

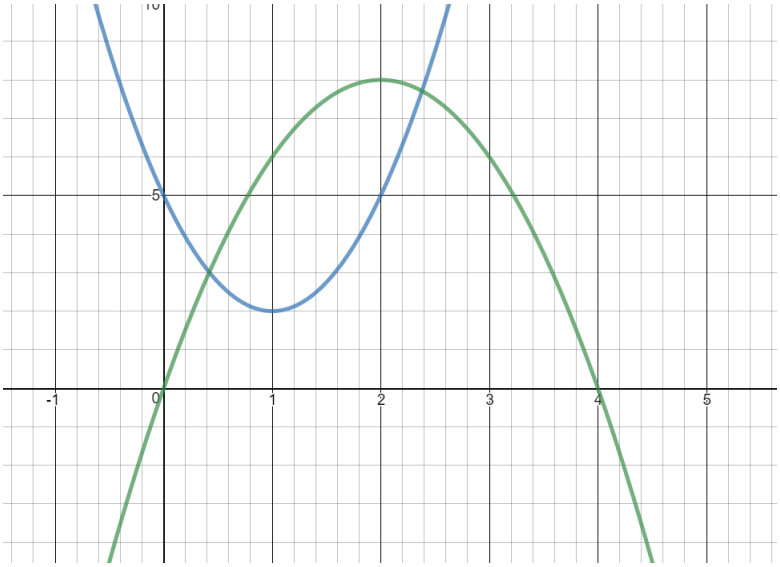
find the zeros (x-intercepts)

TWO METHODS

1. Get equation into standard form + find zeros. (example 1)
2. Graph two functions and find intersection. (example 3)

TO DO

1. CYU (p379-380)
2. p380-381 | 5-13 (NOT #11)


10
5
-1
0
1
2
3
4
5