4.1 Graphical Solutions of Quadratic Equations

graph → zeros
equ^n → roots
→ sol^{n}s

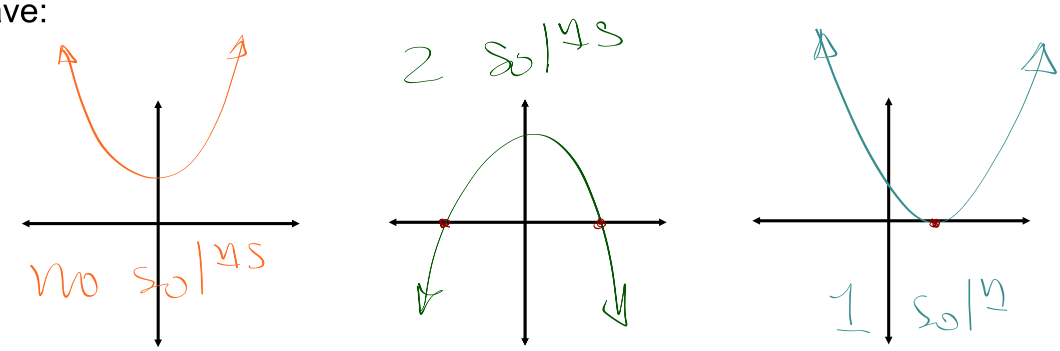
* A quadratic equation is an equation that can be written in the form:

$$0 = ax^2 + bx + c$$

* The solutions to a quadratic equation are called roots.

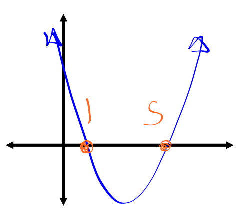
* It should be noted that while a quadratic equation only contains one variable, by considering its related quadratic function, we see that the roots of the equation are the same as the zeroes on the graph of the function.

* As we saw with the graphs of quadratic functions, quadratic equations may have:



* On a graphing calculator, we can get the zeroes of the graph by using the "Calc" button followed by the "zero" feature.

ex. find the solutions to $0 = x^2 - 6x + 5$ $\implies y = x^2 - 6x + 5$



OR use 2nd "table"
find where $y = 0$

...now we can verify the roots of the equation by substituting them back into the equation to see if LS = RS.

$LS = 0$ $\qquad$ $RS = x^2 - 6x + 5$

test $\boxed{x = 1}$ ✓

$RS = (1)^2 - 6(1) + 5$
$= 1 - 6 + 5$
$= 0 = LS$

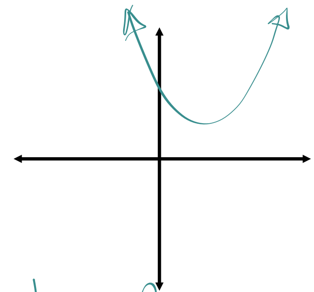
test $\boxed{x = 5}$ ✓

$RS = (5)^2 - 6(5) + 5$
$= 25 - 30 + 5$
$= 0 = LS$

ex. solve -2 = 2x² + *x* by graphing

Set LS=0 ⇒ $\boxed{0 = 2x^2 + x + 2}$ equ^n

graph ⇒ $\boxed{y = 2x^2 + x + 2}$ related function



∴ we have no real roots to the equ^n since the vertex of the related function is above the x-axis and it opens up.

Remember this one?

Gumdrop Joe slips on the slippery FH parking lot and falls to the ground. His hat however flies into the air with the greatest of ease. The height of his hat is described by the equation

$h = -5t^2 + 20t + 1$

(a) What is the maximum height of the hat?

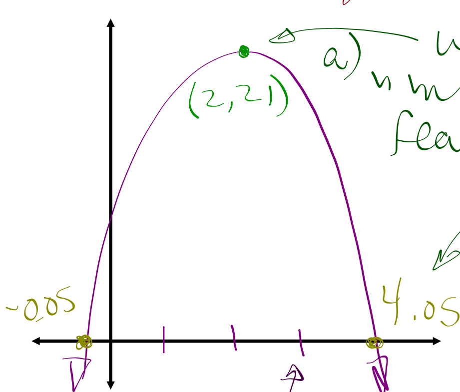
(b) When will the hat hit the ground?

old sol^n

a) vertex → $-\frac{b}{2a}$ → get max value

b) set h=0 and solve for t

new sol^n: graph and get zeroes



a) use "max" feature

b) use the "zero" feature

how often we see dots

window:

Xmin = -1

Xmax = 5

Xscl. = 1

Ymin = -5

Ymax = 25

Yscl. = 2

Homefun: pg. 215 #1, 2, 3abe, 4ab, 5-8, 13, 17-19