

1.21 - Solving by Graphing

Key Ideas

To solve for the solutions of an equation in the form $ax^2 + bx + c = 0$, you can graph the equation $y = ax^2 + bx + c$, check where $y=0$ (the x -intercepts, or "zeroes"), and find the values of x that satisfy the original equation.

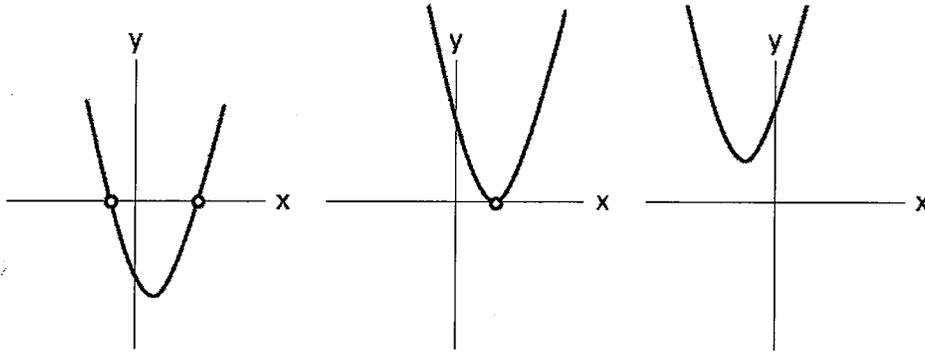
In other words...

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

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

Graph $y = ax^2 + bx + c$ and solve for the x -intercepts (zeroes)

Quadratic functions can have (a) one, (b) two, or (c) no solutions.



Two x-Intercepts

Two real zeroes

Two real roots

Zeroes of multiplicity 1

One real x-Intercept

One real zero

One real root

Zero of multiplicity 2

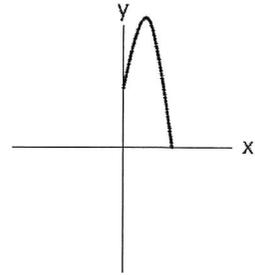
No real x-Intercepts

No real zeroes

No real roots

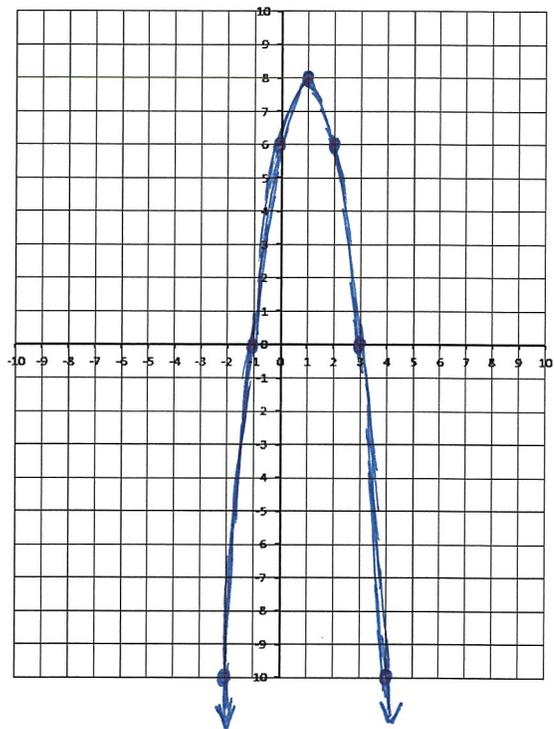
Part 1 – Roots and Zeroes ($ax^2 + bx + c = 0$)

Q1: A grasshopper is sitting on a rock when it decides to jump off, as depicted to the right. The height of a grasshopper, $h(x)$, as a function of horizontal position, x , is given by the equation $h(x) = -2x^2 + 4x + 6$. Both variables are measured in centimeters.



Create a table of values to graph the function.

| x | y |
|----|-----|
| -2 | -10 |
| -1 | 0 |
| 0 | 6 |
| 1 | 8 |
| 2 | 6 |
| 3 | 0 |
| 4 | -10 |



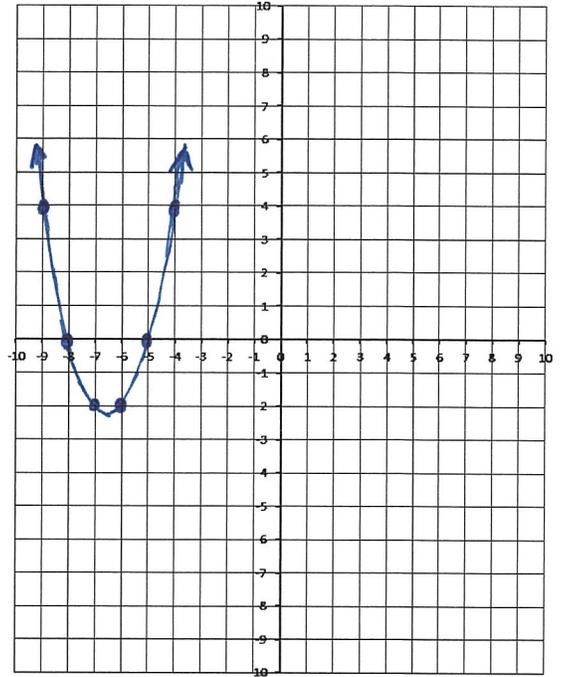
What horizontal distance did the grasshopper travel before landing?

3cm

Q2: Solve the equation $x^2 + 13x + 40 = 0$ graphically.

| x | y |
|----|----|
| -9 | 4 |
| -8 | 0 |
| -7 | -2 |
| -6 | -2 |
| -5 | 0 |
| -4 | 4 |

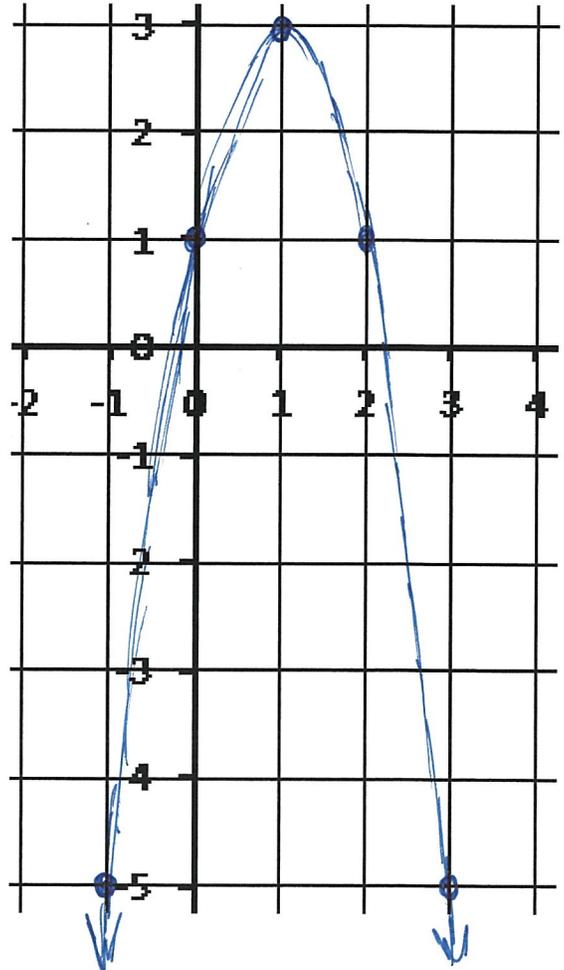
$x = -8, 5$



Q3: Solve the equation $-2x^2 + 4x + 1 = 0$ graphically.

| x | y |
|----|----|
| -1 | -5 |
| 0 | 1 |
| 1 | 3 |
| 2 | 1 |
| 3 | -5 |

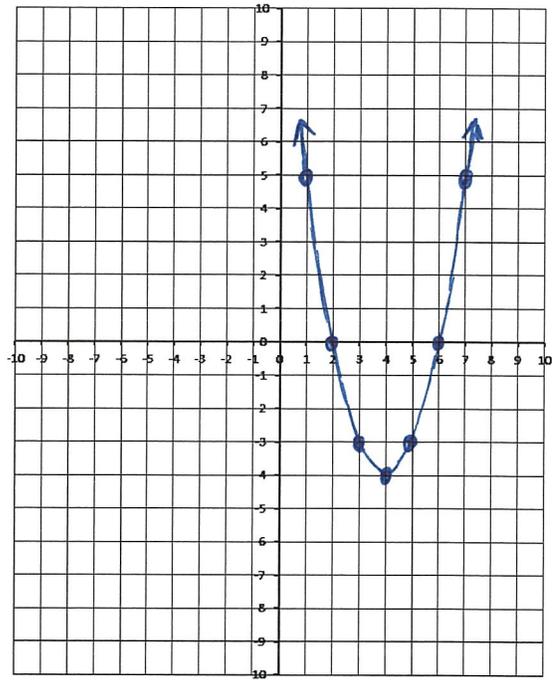
$x \approx -0.2, +2.2$



Part 2 – Roots and Zeroes ($ax^2 + bx + c = d$)Q4a: Solve the equation $x^2 - 8x + 16 = 4$ graphically (Recommended method)

| x | y |
|---|----|
| 1 | 5 |
| 2 | 0 |
| 3 | -3 |
| 4 | -4 |
| 5 | -3 |
| 6 | 0 |
| 7 | 5 |

$$x = 2, 6$$

Q4b: Solve the equation $x^2 - 8x + 16 = 4$ graphically (Intersection of 2 Lines)

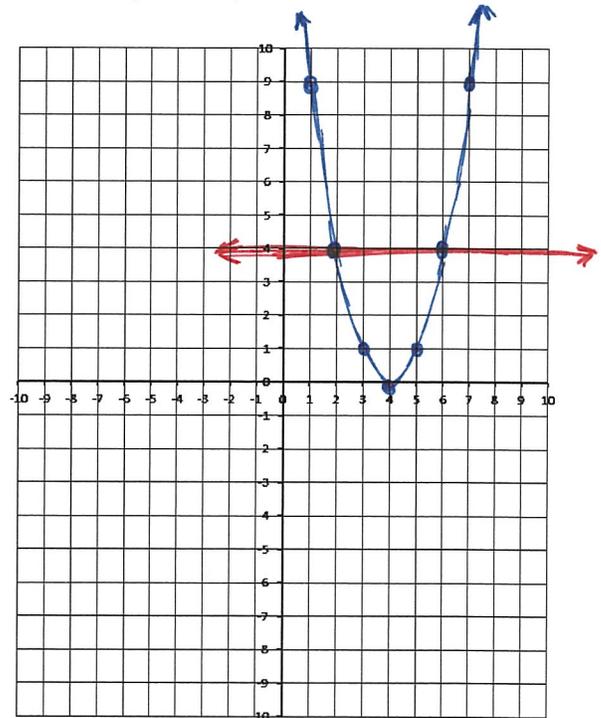
$$y = x^2 - 8x + 16$$

| x | y |
|---|---|
| 1 | 9 |
| 2 | 4 |
| 3 | 1 |
| 4 | 0 |
| 5 | 1 |
| 6 | 4 |
| 7 | 9 |

$$y = 4$$

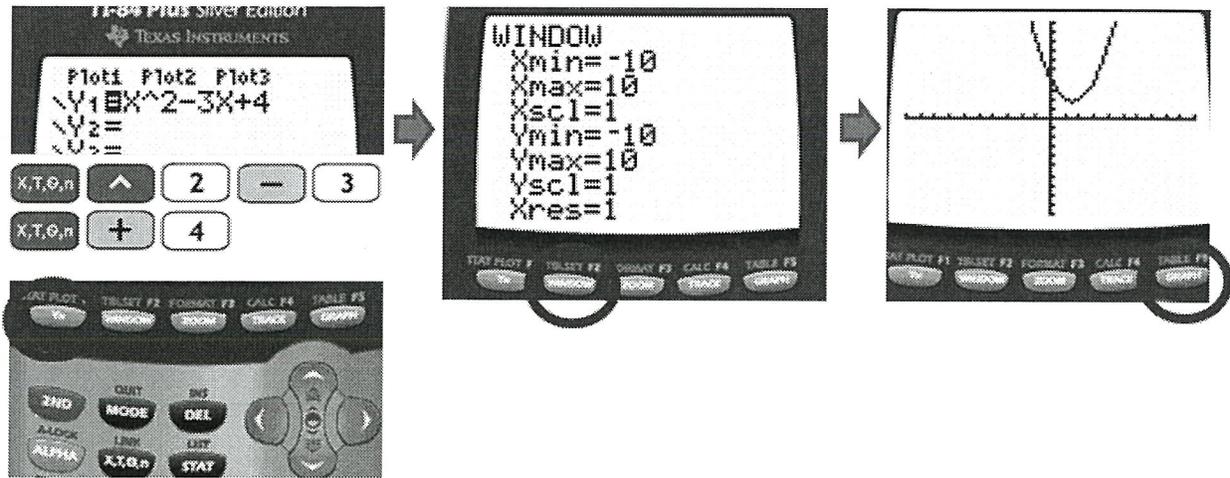
| x | y |
|---|---|
| 1 | 4 |
| 2 | 4 |
| 3 | 4 |
| 4 | 4 |
| 5 | 4 |
| 6 | 4 |
| 7 | 4 |

$$x = 2, 6$$

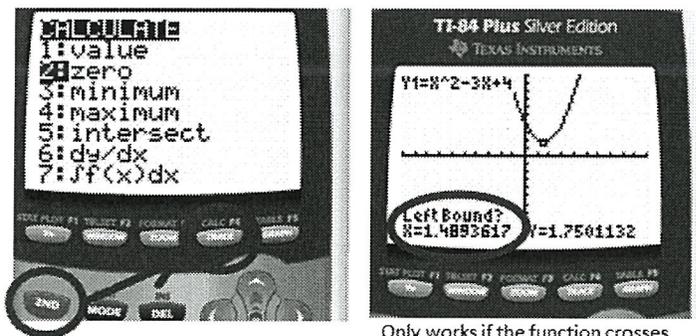


Part 3 – TI Smartview Graphing (Equation, Window, Zeroes)

1. With your calculator, graph $f(x) = x^2 - 3x + 4$



2. Find the Zeroes



Only works if the function crosses the x-axis (i.e. there is a "zero" value of v)

Q4c: Solve the equation $x^2 - 8x + 16 = 4$ using your T.I. Calculator.

$x = 2, 6$

Part 4 – Alternate Methods

L22 – Solving quadratic equations using factoring

L24 – Solving quadratic equations by using the "Quadratic Formula"