Math 20-1

KEY

L16 – 4.1 Graphical Solutions of Quadratic Equations

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.

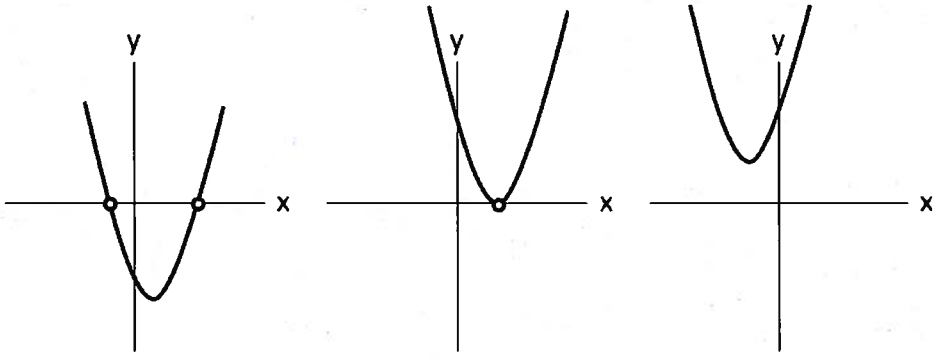
In other words...

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

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

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-Intercept s	*One real x-Intercept*	*No real x-Intercepts*
Two real zeroes	*One real zero*	*No real zeroes*
Two real roots	*One real root*	*No real roots*
Zeroes of multiplicity 1	*Zero of multiplicity 2*	

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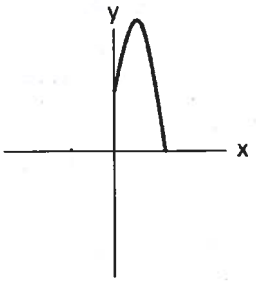
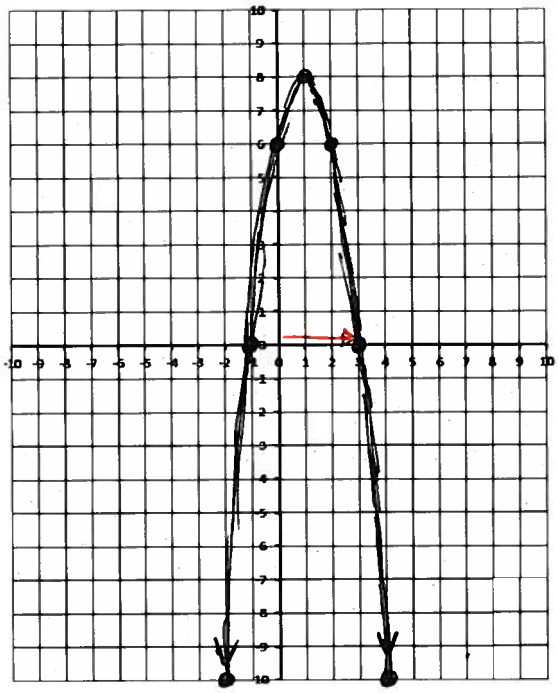
Part 1 – Roots and Zeroes ($ax^2 + bx + c = 0$)

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

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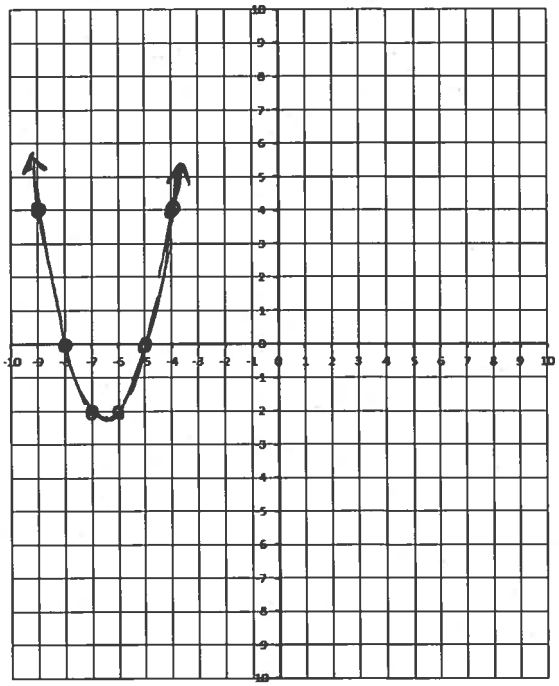
Q2: Solve the equation $x^2 + 13x + 40 = 0$ graphically.

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

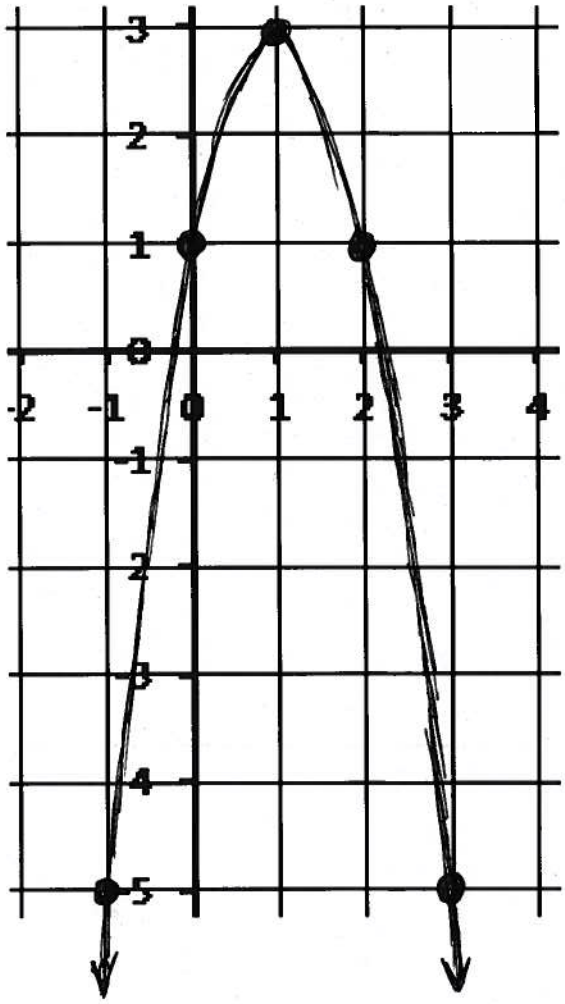
$x = -8, -5$



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

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

$x \approx -0.2, +2.2$



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

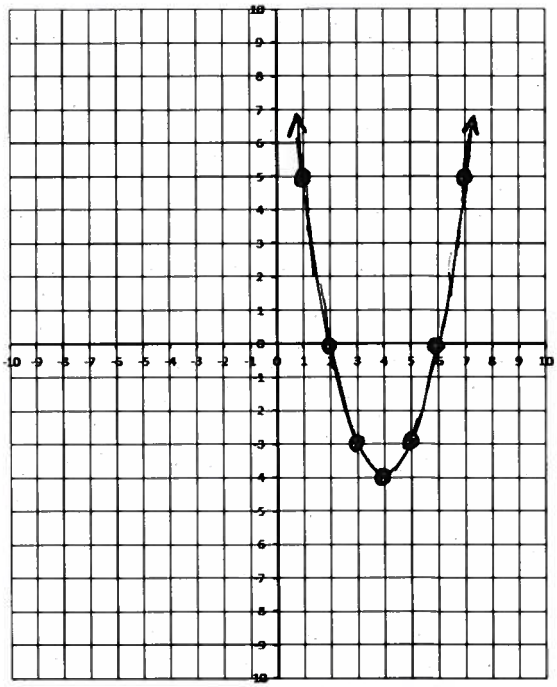
Q4: Solve the equation $x^2 - 8x + 16 = 4$ graphically *(Recommended method)*

$-4 \quad -4$

$x^2 - 8x + 12 = 0$

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)*

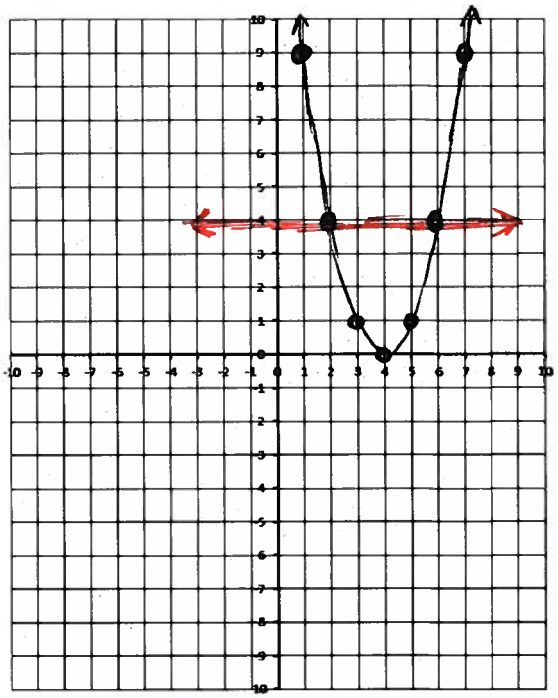
$y = x^2 - 8x + 16$

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

$x = 2, 6$



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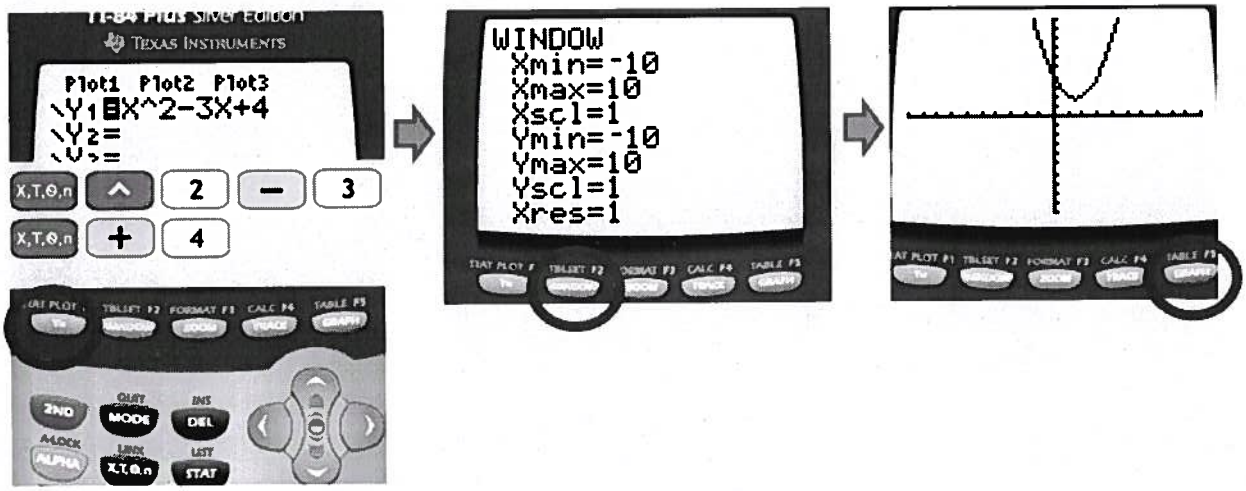
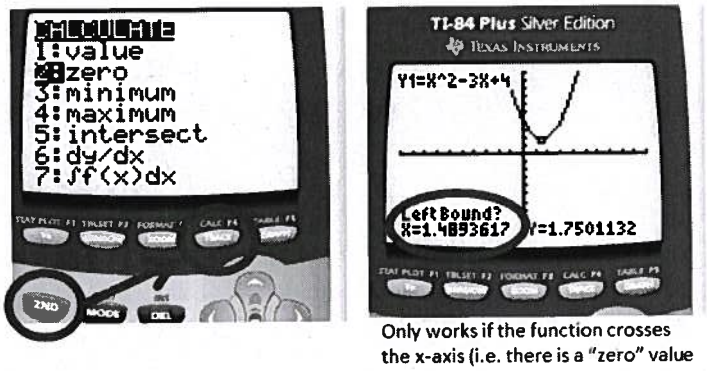
Part 3 – TI Smartview Graphing (Equation, Window, Zeroes)

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 y)

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

$x = 2, 6$

Part 4 – Alternate Methods

L17 – Solving quadratic equations using factoring
L18 – Solving quadratic equations by completing the square
L20 – Solving quadratic equations by using the "Quadratic Formula"