3.8 To Be Determined . . .

A Develop Understanding Task

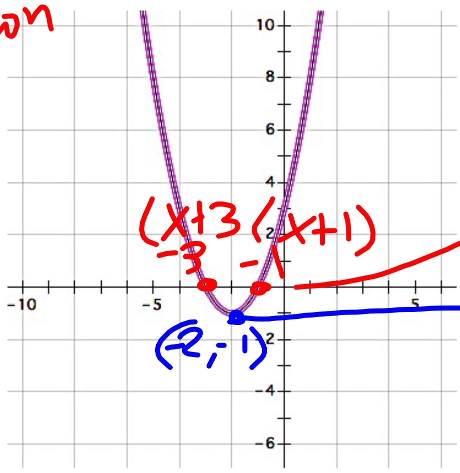
Israel and Miriam are working together on a homework assignment. They need to write the equations of quadratic functions from the information given in a table or a graph. At first, this work seemed really easy. However, as they continued to work on the assignment, the algebra got more challenging and raised some interesting questions that they can't wait to ask their teacher.

Work through the following problems from Israel and Miriam's homework. Use the information in the table or the graph to write the equation of the quadratic function in all three forms. You may start with any form you choose, but you need to find all three equivalent forms. (If you get stuck, your teacher has some hints from Israel and Miriam that might help you.)

1.

3.8 lesson

x	y
-5	8
-4	3
-3	0
-2	-1
-1	0
0	3
1	8
2	15
3	24
4	35



$(x+3)(x+1)$

$-3 \quad -1$

$(-2,-1)$

Standard form:

x^2+4x+3

Factored form:

$(x+3)(x+1)$

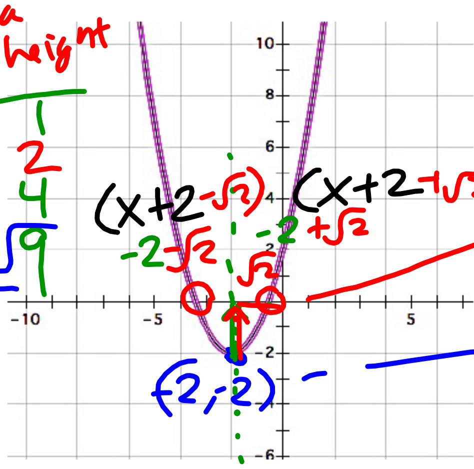
Vertex form:

$(x+2)^2-1$

2.

x	y
-5	7
-4	2
-3	-1
-2	-2
-1	-1
0	2
1	7
2	14
3	23
4	34

distance	height
1	1
$\sqrt{2}$	2
2	4
3	$\sqrt{9}$



$(x+2-\sqrt{2})(x+2+\sqrt{2})$

$-2-\sqrt{2} \quad -2+\sqrt{2}$

$(-2,-2)$

Standard form:

x^2+4x+2 ✓

Factored form:

$(x+2-\sqrt{2})(x+2+\sqrt{2})$

Vertex form:

$(x+2)^2-2$

$(x+2)(x+2)-2$

$x^2+4x+4-2$

x^2+4x+2

$\boxed{x^2+4x+2}$

	x	2	$-\sqrt{2}$
x	x^2	$2x$	$-\sqrt{2}x$
2	$2x$	4	$-2\sqrt{2}$
$\sqrt{2}$	$\sqrt{2}x$	$2\sqrt{2}$	-2

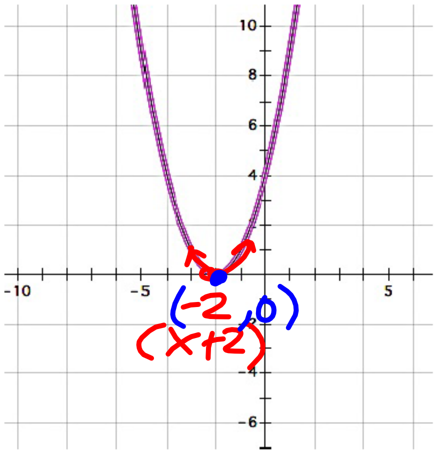
$\sqrt{2}\cdot\sqrt{2}$

$-(\sqrt{2})^2$

-2

3.

x	y
-5	9
-4	4
-3	1
-2	0
-1	1
0	4
1	9
2	16
3	25
4	36



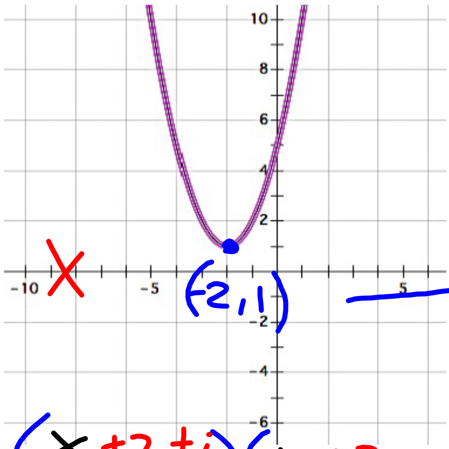
Standard form:
x^2+4x+4

Factored form:
$(x+2)(x+2)$

Vertex form:
$(x+2)^2+0$

4.

x	y
-5	10
-4	5
-3	2
-2	1
-1	2
0	5
1	10
2	17
3	26
4	37



Standard form:
x^2+4x+5 ✓

Factored form:
$(x+2+i)(x+2-i)$

Vertex form:
$(x+2)^2+1=0$
$-1 \quad -1$
$\sqrt{(x+2)^2}=\sqrt{-1}$
$x+2=\pm\sqrt{-1}$
-2
$x=-2\pm 1i$
$x=-2\pm i$

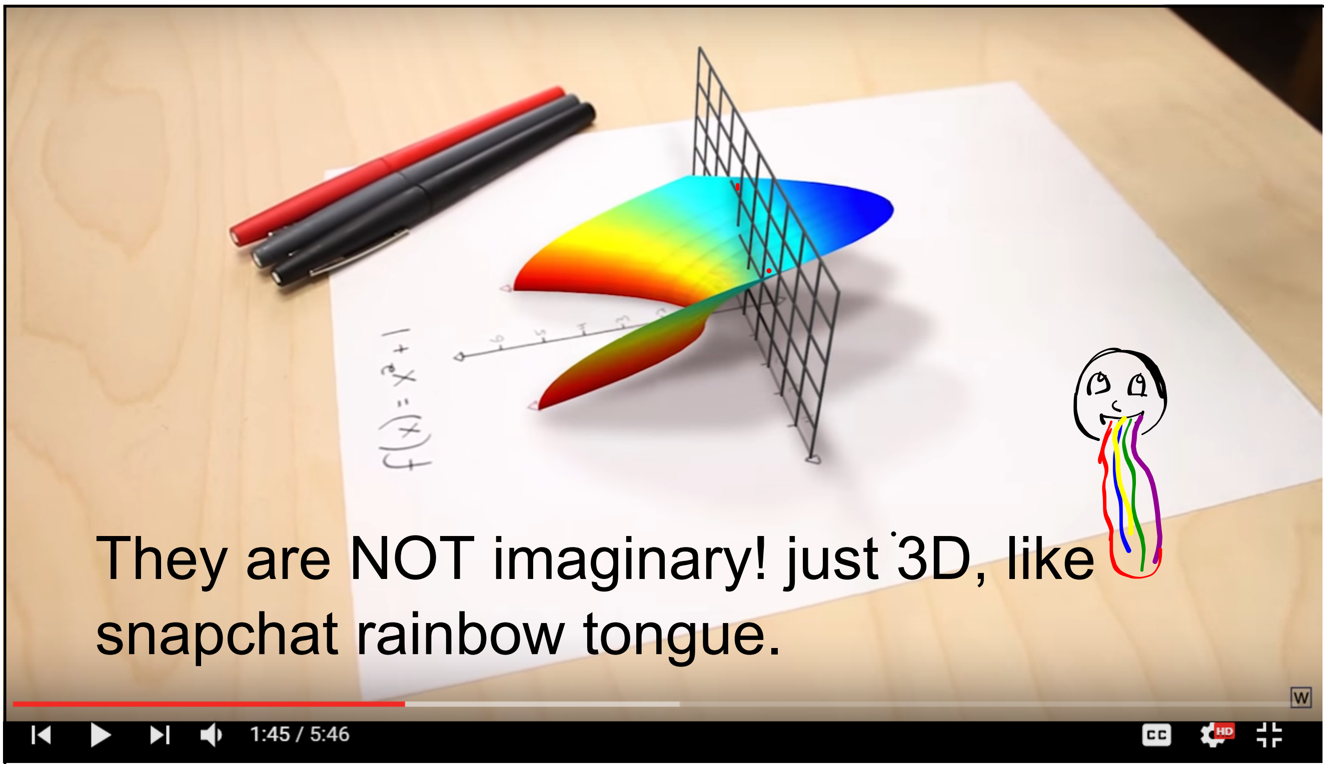
$i=\sqrt{-1}$
$(i)^2=(\sqrt{-1})^2$
$i^2=-1$

$(x+2+i)(x+2-i)$

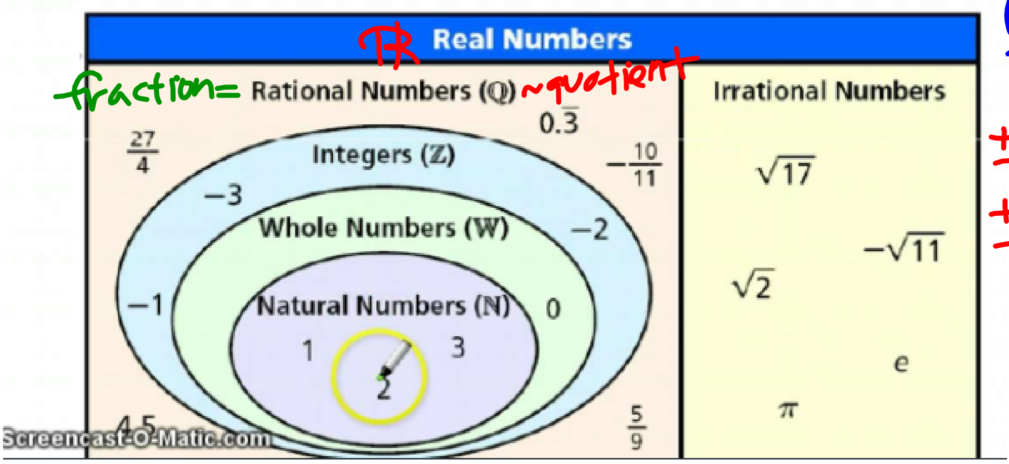
	x	2	i
x	x^2	$2x$	$\cancel{xi}$
2	$2x$	4	$\cancel{2i}$
$-i$	$\cancel{-xi}$	$\cancel{-2i}$	1

$-i\cdot i$
$-i^2$
$-(-1)$

$\boxed{x^2+4x+5}$


They are NOT imaginary! just 3D, like snapchat rainbow tongue.
1:45 / 5:46

All numbers that can be represented on a number line are called **real numbers** and can be classified according to their characteristics.



Complex

$\pm i$ pure imaginary

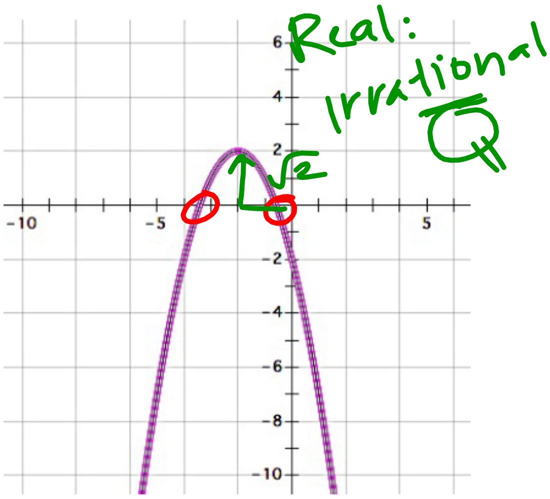
$\pm 2i$

$2 - i$, $2 + i$

real + imaginary

7.

x	y
-5	-7
-4	-2
-3	1
-2	2
-1	1
0	-2
1	-7
2	-14
3	-23
4	-34



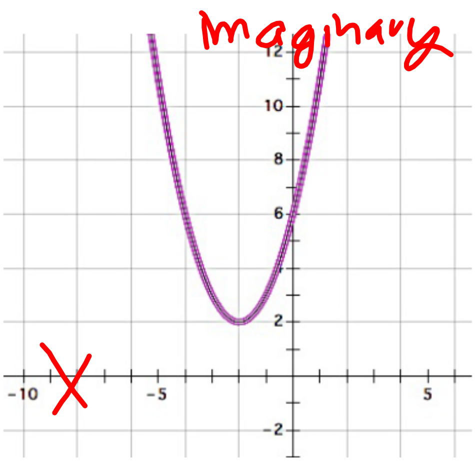
Standard form:

Factored form:

Vertex form:

8.

x	y
-5	11
-4	6
-3	3
-2	2
-1	3
0	6
1	11
2	18
3	27
4	38



Standard form:

Factored form:

Vertex form:

The Fundamental Theorem of Algebra

$x^5 \ldots \ldots \rightarrow$ 5 solutions

$x^3 \ldots \rightarrow$ 3 solutions.

*imaginary #, sets of 2

i & $-i$

A polynomial function is a function of the form:

$$y = a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \cdots a_{n-3} x^3 + a_{n-2} x^2 + a_{n-1} x + a_n$$

where all of the exponents are positive integers and all of the coefficients $a_0 \ldots a_n$ are constants.

As the theory of finding roots of polynomial functions evolved, a 17th century mathematician, Girard (1595-1632) made the following claim which has come to be known as the Fundamental Theorem of Algebra: *An n^{th} degree polynomial function has n roots.*

SECONDARY MATH II // MODULE 3
SOLVING QUADRATICS & OTHER EQUATIONS – 3.8

3.8

READY, SET, GO! Name Period Date

READY

Topic: Simplifying Radicals

Simplify each of the radicals below.

1. $\sqrt{8}$ $\sqrt{4}\sqrt{2 \cdot 2 \cdot 2}$ 2 $\boxed{2\sqrt{2}}$

2. $\sqrt{18}$

3. $\sqrt{32}$

4. $\sqrt{20}$

5. $\sqrt{45}$

6. $\sqrt{80}$

7. What is the connection between the radicals above? Explain.

SET

Topic: Determine the nature of the x-intercepts for each quadratic below.

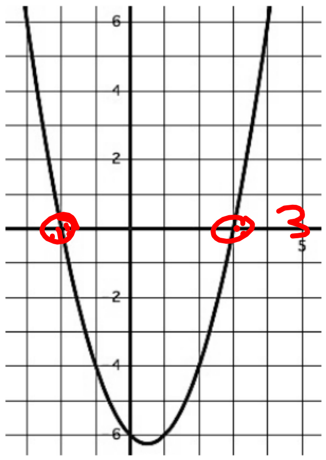
Given the quadratic function, its graph or other information, below determine the nature of the x-intercepts (what type of number it is). Explain or show how you know.

(Whole numbers “𝕎”, Integers “ℤ”, Rational “ℚ”, Irrational “$\overline{\mathbb{Q}}$”, or finally, “not Real”)

1, 2, 3   -1 -2 $\frac{1}{2}$ $\sqrt{2}$, π i.

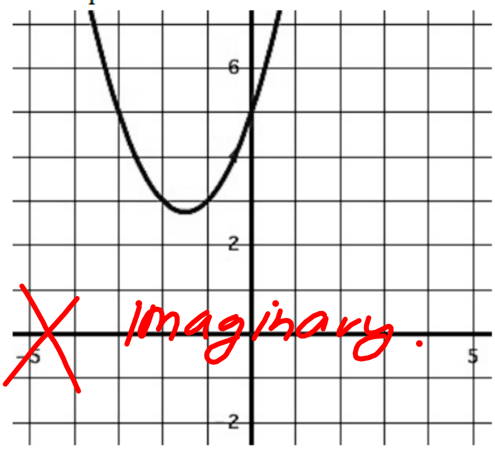
8. Determine the nature of the x-intercepts.

W
Z
Q



3 $\frac{3}{1}$ $\frac{6}{2}$

9. Determine the nature of the x-intercepts



imaginary.

10. Determine the nature of the x-intercepts.

$$f(x) = \overset{a}{x^2} + \overset{b}{4x} - \overset{c}{24}$$

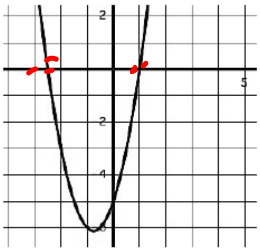
imaginary. $\leftarrow \sqrt{\ } = \sqrt{4^2 - 4(1)24}$

11. Determine the nature of the x-intercepts.

$$g(x) = 0 = (2x - 1)(5x + 2) = 0?$$

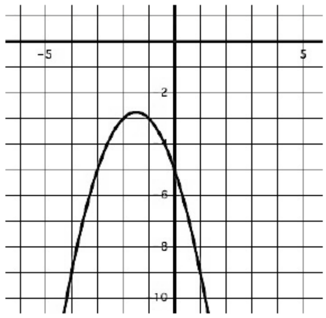
2, Q $\frac{1}{2}$ $-\frac{2}{5}$

12. Determine the nature of the x-intercepts.



$$f(x) = 2x^2 + 3x - 5$$

13. Determine the nature of the x-intercepts.



14. Determine the nature of the x-intercepts.

$$r(t) = t^2 - 8t + 16$$

15. Determine the nature of the x-intercepts.

$$h(x) = 3x^2 - 5x + 9$$

→ solutions, zeros x-intercepts.

Determine the number of roots that each polynomial will have.

16. $x^5 + 7x^3 - x^2 + 4x - 21$

→ 5 solutions
5 roots.

17. $4x^3 + 2x^2 - 3x - 9$

18. $2x^7 + 4x^5 - 5x^2 + 16x + 3$

GO

Topic: Finding x-intercepts for quadratics using factoring and quadratic formula.

If the given quadratic function can be factored then factor and provide the x-intercepts. If you cannot factor the function then use the quadratic formula to find the x-intercepts.

19. $A(x) = x^2 + 4x - 21$

20. $B(x) = 5x^2 + 16x + 3$

21. $C(x) = x^2 - 4x + 1$

$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(1)}}{2}$

$\frac{4 \pm \sqrt{12}}{2}$

$\frac{4 \pm 2\sqrt{3}}{2}$

$\boxed{2 \pm \sqrt{3}}$

22. $D(x) = x^2 - 16x + 4$

23. $E(x) = x^2 + 3x - 40$

24. $F(x) = 2x^2 - 3x - 9$

25. $G(x) = x^2 - 3x$

26. $H(x) = x^2 + 6x + 8$

27. $K(x) = 3x^2 - 11$

$3x^2 + 0x - 11$

$x = \frac{-0 \pm \sqrt{0^2 - 4(3)(-11)}}{2(3)} = \frac{\pm\sqrt{132}}{6} = \frac{\pm 2\sqrt{33}}{6}$

$\boxed{\frac{\pm\sqrt{33}}{3}}$