4-3 HW Answer Key

i^0 = ___1_____ i^4 = _____1_____ i^8 = _____1_____

i^1 = ___i_____ i^5 = _____ i _____ i^9 = _____i _____

i^2 = ___-1_____ i^6 = _____-1_____ i^{10} = __-1_____

i^3 = _____-i_____ i^7 = ___-i _____ i^{11} = ___-i _____

1. i
2. i
3. -i
4. 1
5. i
6. -1
7. -5
8. 1
9. -9
10. -2i
11. 11 + 14i
12. -1
13. x = 8, y = 3
14. x = -3, y = -5
15. x = ±6i
16. x = ±2i
17. $12i\sqrt{2}$
18. See attached for graph.

Name Key Alg 2 Homework 4-3

Simplify the following:

$i^0 = 1$ $i^4 = 1$ $i^8 = 1$

$i^1 = i$ $i^5 = i$ $i^9 = i$

$i^2 = -1$ $i^6 = -1$ $i^{10} = -1$

$i^3 = -i$ $i^7 = -i$ $i^{11} = -i$

Simplify the following:

1. $i^{33} = i^{32} \cdot i^1 = i$

2. $i^{425} = i^{424} \cdot i^1 = i$

3. $i^{51} = i^{48} \cdot i^3 = -i$

4. $i^{64} = 1$

5. $-i^{11} = -i^8 i^3 = i$

6. $i^{18} = i^{16} \cdot i^2 = -1$

7. $5i^{10} = 5i^8 i^2 = 5(-1) = -5$

8. $(i^5)(i^7) = i^{12} = 1$

9. $4i^2 - 5i^{16} = 4(-1) - 5(1) = -4 - 5 = -9$

10. $2i^{15} = 2i^{12} i^3 = 2(-i) = -2i$

Express each of the following in a + bi form.

11. $(8 + 9i) + (3 + 5i) = 11 + 14i$

12. $(7 + 2i) + (3 - 5i) - (11 - 3i) =$

$10 - 3i - 11 + 3i$

$= -1$

Find the real values of x and y.

13. $3x + 6yi = 24 + 18i$

$3x = 24$ $6y = 18$

$x = 8$ $y = 3$

14. $5(x - 1) + 3yi = -15i - 20$

$5x - 5 = -20$ $3y = -15$

$5x = -15$ $y = -5$

$x = -3$

Solve for x and put your answer in a + bi form.

15. $2x^2 + 72 = 0$

$2x^2 = -72$

$x^2 = -36$

$x = \pm 6i$

16. $4x^2 + 16 = 0$

$4x^2 = -16$

$x^2 = -4$

$x = \pm 2i$

Simplify.

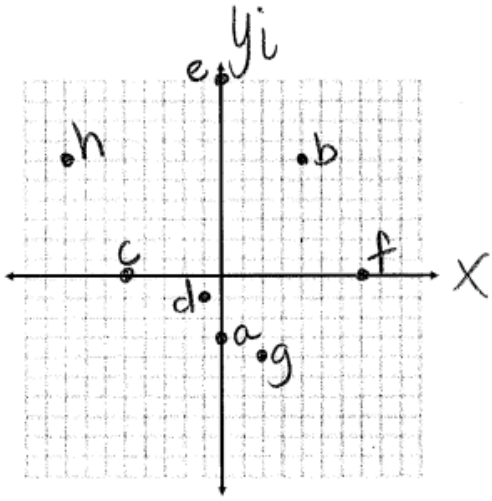
17. $\sqrt{-24} \cdot 2\sqrt{3} = i\sqrt{24} \cdot 2\sqrt{3}$

$= 2i\sqrt{72}$

$= 2i\sqrt{36}\sqrt{2} = 12i\sqrt{2}$

Graph and label the corresponding points on the complex plane.

a. -3i
b. 4 + 6i
c. -5
d. -1 - i
e. 0 + 10i
f. 7 - 0i
g. 2 - 4i
h. -8 + 6i



Complex numbers as solutions to equations Algebra 2 Unit 4 Day 4

Today, we are going to use the quadratic formula to solve quadratic equations.

Recall the quadratic formula:

The discriminant is the number under the radical or _____.

Working with your partner, **determine the discriminant** and then solve the following quadratic equations **using the quadratic formula**.

1. $x^2 - 9 = 0$

2. $x^2 - 6x + 9 = 0$

$b^2-4ac = 36-4(1)(9)$

$= 0$

$x = \frac{6 \pm \sqrt{0}}{2(1)}$

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

3. $x^2 + 9 = 0$

$b^2-4ac = 0-4(1)(9)$

$= -36$

$x = \frac{0 \pm \sqrt{-36}}{2(1)}$

$= \frac{\pm 6i}{2} = \pm 3i$

How does the value of the discriminant relate to the solutions you found?

_____

_____

_____

Complex numbers as solutions to equations Algebra 2 Unit 4 Day 4

Today, we are going to use the quadratic formula to solve quadratic equations.

Recall the quadratic formula: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

The discriminant is the number under the radical or b^2-4ac.

Working with your partner, **determine the discriminant** and then solve the following quadratic equations **using the quadratic formula**.

1. $x^2 - 9 = 0$

$a=1\ b=0\ c=-9$

$b^2-4ac=0-4(1)(-9)$

$=36$

$x=\frac{0\pm\sqrt{36}}{2(1)}=\frac{\pm6}{2}$

$x=\pm3$

2. $x^2 - 6x + 9 = 0$

$b^2-4ac=36-4(1)(9)$

$=0$

$x=\frac{6\pm\sqrt{0}}{2(1)}$

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

3. $x^2 + 9 = 0$

$b^2-4ac=0-4(1)(9)$

$=-36$

$x=\frac{0\pm\sqrt{-36}}{2(1)}$

$=\frac{\pm6i}{2}=\pm3i$

How does the value of the discriminant relate to the solutions you found?

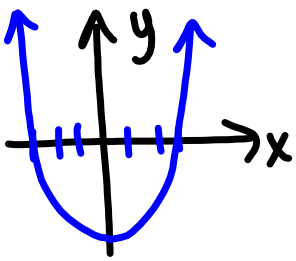
If $b^2-4ac<0$, the solutions will be imaginary (complex)

If $b^2-4ac=0$, we will have 1 Real solution (2 equal)

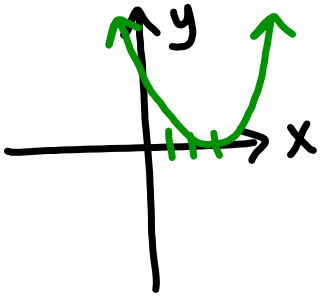
If $b^2-4ac>0$, the solution will be 2 Real solutions

Using your graphing calculator, sketch a graph of each of the quadratic equations from above.

1. $x^2 - 9 = 0$



2. $x^2 - 6x + 9 = 0$



3. $x^2 + 9 = 0$

Conclusions:

(2) When the graph intersects x-axis only once, then there is 1 Real solution, and the discriminant is zero.

(1) When the graph intersects x-axis twice, then there are 2 Real solutions, and the discriminant is positive (>0)

When the graph does not intersects x-axis, then there are complex (imag.) Roots and the discriminant is negative (<0)

For 1- 7 do the following:

1. Compute the value of the discriminant of the quadratic equation.
2. Use the value of the discriminant to predict the number and type of solutions.
3. Find all real and complex solutions.

$a+bi$ form

Do first one together:

1. $3x + x^2 = -7 \Rightarrow x^2+3x+7=0$

$b^2-4ac = 9-4(1)(7) = 9-28 = -19$ Complex Solutions

$x = \frac{-3 \pm \sqrt{-19}}{2(1)} = \frac{-3 \pm i\sqrt{19}}{2} = \boxed{\frac{-3}{2} \pm \frac{i\sqrt{19}}{2}}$

$a + bi$

Work on the following individually, checking your answers with your partner as you complete each one.

2. $x^2 + 4 = 0$

$b^2-4ac = 0-4(1)(4)$

$= -16$

2 Complex solutions

$x = \frac{0 \pm \sqrt{-16}}{2(1)}$

$= \pm\frac{4i}{2}$

$= \pm 2i \quad \{\pm 2i\}$

3. $x^2 + 2x + 1 = 0$

$b^2 - 4ac = 4 - 4(1)(1)$
$= 0$

1 real solution

$x = \frac{-2 \pm \sqrt{0}}{2(1)}$
$= \frac{-2}{2}$
$= -1$ $\{-1\}$

4. $3x^2 + 4x + 2 = 0$

$b^2 - 4ac = 16 - 4(3)(2)$
$= -8$

2 complex solutions

$x = \frac{-4 \pm \sqrt{-8}}{2(3)}$
$= \frac{-4 \pm i\sqrt{4}\sqrt{2}}{6}$
$= \frac{-4 \pm 2i\sqrt{2}}{6}$
$= \frac{-2 \pm i\sqrt{2}}{3}$ $\left\{-\frac{2}{3} \pm \frac{i\sqrt{2}}{3}\right\}$

5. $x = 2x^2 + 5$

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

$b^2 - 4ac = 1 - 4(2)(5)$

$= -39$

2 complex solutions

$x = \frac{1 \pm \sqrt{-39}}{2(2)}$

$= \frac{1 \pm i\sqrt{39}}{4}$

$\left\{\frac{1}{4} \pm \frac{i\sqrt{39}}{4}\right\}$

6. $9x^2 - 4x - 14 = 0$

$b^2 - 4ac = 16 - 4(9)(-14)$

$= 520$

2 real solutions

$x = \frac{4 \pm \sqrt{520}}{2(9)}$

$= \frac{4 \pm \sqrt{4}\sqrt{130}}{18}$

$= \frac{4 \pm 2\sqrt{130}}{18}$

$= \frac{2 \pm \sqrt{130}}{9}$

$\left\{\frac{2 \pm \sqrt{130}}{9}\right\}$

7. $\frac{8x^2+4x+32=0}{4}$ (Note: Easier if you factor first)

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

$b^2-4ac=1-4(2)(8)$

$=-63$

2 complex solutions

$x=\frac{-1\pm\sqrt{-63}}{2(2)}$

$=\frac{-1\pm i\sqrt{9}\sqrt{7}}{4}$

$=\frac{-1\pm 3i\sqrt{7}}{4}$ $\left\{-\frac{1}{4}\pm\frac{3i\sqrt{7}}{4}\right\}$