

Complex Numbers

- Complex Numbers are based on a number whose square is -1.
- The **imaginary unit** i :

$$i = \sqrt{-1}$$

$$i^2 = -1$$

- Imaginary numbers and real numbers together make up the set of *complex numbers*.
- Complex numbers can be written in the form: $a + bi$
 - Where a and b are real numbers
- In *COMPLEX number plane*, to Graph (a, b) which represents $a + bi$:
 - Locate real part on horizontal axis and imaginary part on vertical axis.
- To *add* or *subtract* complex numbers, combine real parts together and combine imaginary parts together.
- *Multiply* complex numbers/binomials the same as you do real numbers.
- $a + bi$ and $a - bi$ are called *complex conjugates* of each other. Their product is a real number! We often multiply the numerator and denominator by the conjugate of the denominator to get rid of the radical (i) in the denominator.

Examples

- How do you write $\sqrt{-24}$ using the imaginary unit i ?
- What is each sum or difference?
 - $(2 + i) + (-3 + 3i)$
 - $(5 + i) + (5 - i)$
 - $(-6 - 2i) - (4 + 2i)$
- What is each product?
 - $-i(4 - 8i)$
 - $(5 - 7i)(-4 - 3i)$

- What is each quotient?

- $\frac{7i}{8+i}$

- $\frac{5+2i}{3-2i}$

- What are the solutions of $3x^2 + 12 = 0$?

- What are the solutions of $-x^2 + 4x - 5 = 0$?