Adding And Subtracting Complex Numbers

Adding and Subtracting
(add or subtract the real parts, then add or subtract the imaginary parts)

Ex: $(-1+2i)+(3+3i)$

Ex: $(2-3i)-(3-7i)$

Ex: $2i-(3+i)+(2-3i)$

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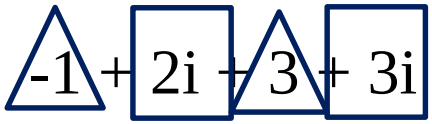
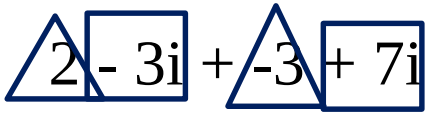


2 + 5i

Ex: $(2-3i)+\overline{(3+7i)}$



-1 + 4i

Ex: $2i+\overline{(3+\overline{i})}+(2-3i)$

$2i - 3 - i + 2 - 3i$

-1 - 2i

Powers of *i* and Multiplying Complex Numbers

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$

$i^5 = i$

$i^6 = -1$

$i^7 = -i$

$i^8 = 1$

$etc.$

*For larger exponents, divide the exponent by 4, then use the remainder as your exponent instead.

Example: $i^{23} = ?$

$\frac{23}{4} = 5$ with a remainder of 3

So, use i^3 which = -i

$i^{23} = -i$

Try These!

1. $i^{13} = i$

2. $i^{27} = -i$

3. $i^{54} = -1$

4. $i^{72} = 1$

Multiplying Complex Numbers

1. Use FOIL, Box Method, or Distributive Property to multiply the Complex Numbers.
   -Treat the i's like variables
2. Change any i^2s to -1

Ex: $-i(3+i)$

$= -3i - i^2$

$= -3i - (-1)$

$= 1 - 3i$

Ex: $(2+3i)(-6-2i)$

$= -12 - 4i - 18i - 6i^2$

$= -12 - 22i - 6(-1)$

$= -12 - 22i + 6$

$= -6 - 22i$

Conjugates:

Two complex numbers of the form a + b*i* and a – b*i* are complex conjugates. The product is always a real number

Ex: $(2+4i)(2-4i)$

$$= 4-8i+8i-16i^2$$
$$= 4-16(-1)$$

Dividing Complex Numbers

Writing in Standard Form

$$Ex: \quad \frac{5-2i}{3+8ii} * \frac{3-8i}{3-8i}$$

$$= \frac{(5-2i)(3-8i)}{(3+8i)(3-8i)}$$

$$= \frac{15-40i-6i+16i^2}{9-24i+24i-64i^2}$$

$$= \frac{15-46i+16(-1)}{9-64(-1)}$$

$$= \frac{15-46i-16}{9+64}$$

$$= \frac{-1-46i}{73}$$

$$= \frac{-1}{73} - \frac{46}{73}i$$

Writing in Standard Form

$$Ex: \frac{3+11i}{-1-2i} * \frac{-1+2i}{-1+2i}$$

$$= \frac{(3+11i)(-1+2i)}{(-1-2i)(-1+2i)}$$

$$= \frac{-3+6i-11i+22i^2}{1-2i+2i-4i^2}$$

$$= \frac{-3-5i+22(-1)}{1-4(-1)}$$

$$= \frac{-3-5i-22}{1+4}$$

$$= \frac{-25-5i}{5}$$

$$= \frac{-25}{5} - \frac{5i}{5}$$

$$= -5-i$$