Intro to College Math: Chapter 11.7
Complex Numbers

* imaginary unit — the number i, such that $i = \sqrt{-1}$, and $i^2 = -1$

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

* complex number — any number that can be written in form $a+bi$

1. Write the following in terms of i, and simplify as much as possible.

$-\sqrt{-9}$

$-i\sqrt{9}$ ← * Change the negative under the $\sqrt{}$ to an "i" outside the $\sqrt{}$

$-i \cdot 3$ * Type the $\sqrt{}$ of the number in the calculator

$\boxed{-3i}$ * Put # first + then i.

2. Write the following in terms of i, and simplify as much as possible (in the form $ai\sqrt{b}$

$-\sqrt{-32}$

$-i\sqrt{32}$ ← * Change the negative under the $\sqrt{}$ to an "i" outside the $\sqrt{}$

$-i \cdot 4\sqrt{2}$ ← * Type the $\sqrt{}$ of the number in the calculator

$\boxed{-4i\sqrt{2}}$ * Rearrange so that the number is 1st, then the "i", then the $\sqrt{}$.

Typing in computer:
* 1st box -- type in number
* 2nd box – type in $\sqrt{}$

3. Write the following as $i, -1, -i$, or 1

i^{52}

$52 \div 4 = 13$

← Divide the exponent by 4,

* If it divides evenly, then the answer is "1".

1

4. Write the following as $i, -1, -i$, or 1

$(-i)^{40}$

$40 \div 4 = 10$

← Divide the exponent by 4,

* If it divides evenly, then the answer is "1".

1

5. Combine the following complex numbers. $(5-4i) + (5+3i)$

$(5-4i) + (5+3i)$

$5 - 4i + 5 + 3i$

Combine numbers →

$10 - 4i + 3i$

← combine i's

$10 - i$

* Since there is an addition sign between them, we can get rid of the ( ) and just combine like terms.

6. Simplify. $(-1-3i)-(2+i)$

$(-1-3i)-(2+i)$ ← * First, distribute the minus sign to each term inside the 2nd set of ( ).

$-1-3i-2-i$ ← * combine numbers

$-3-3i-i$ ← * Combine "i"s

$\boxed{-3-4i}$

7. Multiply. $(-5+5i)(1+3i)$

$(-5+5i)(1+3i)$ ← * Use foil method to multiply each term in 1st set of ( ) by each term in 2nd set of ( ).

$-5-15i+5i+15i^2$ ← * Combine like terms, which should be the "i"s

$-5-10i+15i^2$ ← * Replace "i^2" with "(-1)".

$-5-10i+15(-1)$

$-5-10i-15$ ← * Combine like terms; should be the numbers.

$\boxed{-20-10i}$

8. Multiply. $(4+3i)^2$

$(4+3i)^2$

$(4+3i)(4+3i)$

* the square outside the () means to write down the problem 2 times & multiply together.

* Use foil method to multiply each term in 1st set of () by each term in 2nd set of ().

$16+12i+12i+9i^2$

* Combine like terms, which should be the "i"s

$16+24i+9i^2$

* Replace "i^2" with "(-1)".

$16+24i+9(-1)$

$16+24i-9$

* Combine like terms; should be the numbers.

$7+24i$