hw-04a-review-of-complex-numbers

Due: **12/12/2015 at 06:00am EST.**

Students will be able to:

- Add and Subtract Complex Numbers
- Multiply and Divide Complex Numbers

Functions and symbols that WeBWorK understands.

Links to some useful WeBWorK pages for students

1. (1 pt) Evaluate the expression $(9+4i)+(7+6i)$ and write the result in the form $a+bi$.

The sum is ____.

2. (1 pt) Evaluate the expression $(-5+6i)+(-4+6i)$ and write the result in the form $a+bi$.

The real number a equals ______
The real number b equals ______

3. (1 pt) Evaluate the expression $(-6-4i)-(-8-4i)$ and write the result in the form $a+bi$.

The real number a equals ______
The real number b equals ______

4. (1 pt) Evaluate the expression $(-6+2i)-(6+7i)$ and write the result in the form $a+bi$.

The difference is ____.

5. (1 pt) Evaluate the expression $(9-7i)(-8-5i)$ and write the result in the form $a+bi$.

The product is ____.

6. (1 pt) Write the following numbers in $a + bi$ form:
(a) $(3+i)(5+5i)(-3+3i)$ = ____ + ____ i,
(b) $((-4-4i)^2-3)i$ = ____ + ____ i.

7. (1 pt) Complete the following equations. Your answers will be algebraic expressions.

$(a+bi)(a-bi) =$ ____ + ____ i
$(a+bi)^2-(a-bi)^2 =$ ____ + ____ i
Hint: You can use some of the results in the preceding problem and the discussion of **complex numbers**.

8. (1 pt) Complete the following equation. Your answers will be algebraic expressions.

$(a+bi)^3 =$ __________ + __________ i
Hint: Think of i as an ordinary variable and then replace i^2 with -1.

9. (1 pt) For some practice working with complex numbers:
Calculate
$(4-6i)+(2-5i) =$ ________,
$(4-6i)-(2-5i) =$ ________,
$(4-6i)(2-5i) =$ ________.
The complex conjugate of $(1+i)$ is $(1-i)$. In general to obtain the complex conjugate reverse the sign of the imaginary part. (Geometrically this corresponds to finding the "mirror image" point in the complex plane by reflecting through the x-axis. The complex conjugate of a complex number z is written with a bar over it: $\bar{z}$ and read as "z bar".

Notice that if $z = a+ib$, then
$(z)(\bar{z}) = |z|^2 = a^2+b^2$
which is also the square of the distance of the point z from the origin. (Plot z as a point in the "complex" plane in order to see this.)

If $z = 4-6i$ then $\bar{z} =$ ________ and $|z| =$ ________.

You can use this to simplify complex fractions. Multiply the numerator and denominator by the complex conjugate of the denominator to make the denominator real.

$\frac{4-6i}{2-5i} =$ ____ $+i$ ____.

Two convenient functions to know about pick out the real and imaginary parts of a complex number.

$Re(a+ib) = a$ (the real part (coordinate) of the complex number), and
$Im(a+ib) = b$ (the imaginary part (coordinate) of the complex number. Re and Im are linear functions – now that you know about linear behavior you may start noticing it often.

10. (1 pt) Evaluate the expression

$$\frac{8-7i}{-8-6i}$$

and write the result in the form $a+bi$.

The quotient is ____.

11. (1 pt) Write the following numbers in $a + bi$ form:
(a) $\left(\frac{2+i}{5i - (-5-2i)}\right)^2$ = ____ + ____ i,
(b) $(i)^2(-5+i)^2$ = ____ + ____ i.

12. (1 pt) Calculate the following:
(a) i^3 = ___,
(b) i^4 = ___,
(c) i^5 = ___,
(d) i^6 = ___,
(e) i^{59} = ___,

(f) $i^0 =$ ___,
(g) $i^{-1} =$ ___,
(h) $i^{-2} =$ ___,
(i) $i^{-3} =$ ___,
(j) $i^{-89} =$ ___.

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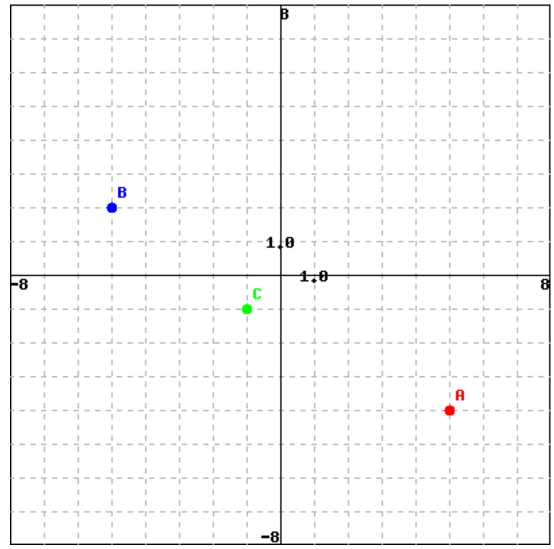
13. (1 pt) Enter the complex coordinates of the following points:



A: _____,
B: _____,
C: _____.