HW/classwork: pg 295 1-27 odd, 29-34 all

The Complex Numbers

Recall: $\sqrt{-1} = i$ and $i^2 = -1$ by definition.

Simplify

Example

1. $i^4 = i^2 \cdot i^2 = (-1)(-1) = \boxed{1}$

2. $i^{12} = (i^2)^6 = (-1)^6 = \boxed{1}$

3. $i^{75} = i^{74} i^1 = (i^2)^{32} i = (-1)^{32}(i) = 1(i) = i$

Note: when you have i to any even exp. you can write it as $(i^2)^{[\;]}$ ← another exponent.

When you have an odd exponent, you can "take out" a single i to make the rest even and deal with the even.

Complex Numbers are numbers that include both Real and Imaginary numbers. They have the form $a + bi$ where a and b are both real numbers.

Note: Sums and products of complex numbers work like sums and products of binomials.

Simplify

Example

Simply treat i as if it were a variable! ... until you get i^2, then replace it with -1

4. $(3+6i)-(4-2i)$

$3+6i-4+2i$

$\boxed{-1+8i}$

5. $(3+4i)^2$

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

	3	4i
3	9	12i
4i	12i	$16i^2$

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

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

$9-16+24i$

$\boxed{-7+24i}$

6. $(\sqrt{3}+\sqrt{-7})(\sqrt{3}-\sqrt{-7})$

$(\sqrt{3}+i\sqrt{7})(\sqrt{3}-i\sqrt{7})$

	$\sqrt{3}$	$i\sqrt{7}$
$\sqrt{3}$	3	$\cancel{i\sqrt{21}}$
$-i\sqrt{7}$	$\cancel{-i\sqrt{21}}$	$-7i^2$

$3-7i^2$

$3-7(-1)$

$3+7$

$\boxed{10}$

Rationalize the denominator by multiplying the top and bottom by the complex conjugate

7. $\dfrac{2+i}{6+2i} \cdot \dfrac{(6-2i)}{(6-2i)}$

	6	2i
6	36	$\cancel{12i}$
-2i	$\cancel{-12i}$	$-4i^2$

$36+4$

40

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

$12+6i-4i-2i^2$

$12+2i+2$

$14+2i$

$\dfrac{14+2i}{40}$

$\dfrac{\cancel{2}(7+2i)}{\cancel{40}\;20}$

$\dfrac{7+i}{20}$

$\boxed{\dfrac{7}{20}+\dfrac{i}{20}}$

8. $(2-i\sqrt{3})(2+i\sqrt{3})$

	2	$-i\sqrt{3}$
2	4	$\cancel{-2i\sqrt{3}}$
$i\sqrt{3}$	$\cancel{2i\sqrt{3}}$	$-i^2 \cdot 3$

$4-(-1)(3)$

$4+3 = \boxed{7}$