Lesson 5-9

Objective - To perform with complex numbers.

Complex Numbers

Any number that can written in the form ***a* + *bi***

real part

complex part

$(8-5i)+(2+i)$

$(8+2)+(-5i+i)$

$10-4i$

$(4+7i)-(2+3i)$

$(4-2)+(7i-3i)$

$2+4i$

Solve.

1) $(4+2i)(3-5i)$

$12-20i+6i-10i^2$

$22-14i$

2) $(8+5i)(2-3i)$

$16+10i-24i-15i^2$

$31-14i$

3) $(3-4i)^2$

$9-24i+16i^2$

$-7-24i$

4) $3(-5-2i)+2(-3+2i)$

$-15-6i-6+4i$

$-21-2i$

Solve. 1) $(-6+2i)(7-i)(4+3i)$

$(-42+20i-2i^2)(4+3i)$

$(-40+20i)(4+3i)$

$-160+80i-120i+60i^2$

$-220-40i$

Simplify.

1) $\dfrac{4-5i}{6i}$

Must rationalize the denominator

i can not be in the denominator

$\dfrac{4-5i}{6i}\cdot\dfrac{i}{i}$

$\dfrac{4i-5i^2}{6i^2}$

$\dfrac{4i-5(-1)}{6(-1)}=\dfrac{5+4i}{-6}$

Simplify.

2) $\dfrac{2+i}{5i}$

$\dfrac{2+i}{5i}\cdot\dfrac{i}{i}$

$\dfrac{2i+i^2}{5i^2}$

$\dfrac{2i+(-1)}{5(-1)}=\dfrac{2i-1}{-5}$ *or* $\dfrac{1-2i}{5}$

Simplify.

3) $\dfrac{8i}{1+3i}$

rationalize the denominator with the conjugate $1-3i$

$\dfrac{8i}{1+3i}\cdot\dfrac{1-3i}{1-3i}$

$\dfrac{8i(1-3i)}{(1+3i)(1-3i)}$

$\dfrac{8i-24i^2}{1-9i^2}=\dfrac{24+8i}{10}=\dfrac{12+4i}{5}$

Divide by 2

Lesson 5-9 (cont.)

Simplify. 4) $\dfrac{6+5i}{3-2i}$

$$\frac{6+5i}{3-2i}\cdot\frac{3+2i}{3+2i}$$

$$\frac{18+12i+15i+10i^2}{9-4i^2}$$

$$\frac{18+12i+15i-10}{9+4}=\frac{8+27i}{13}$$

Simplify. 5) $\dfrac{\sqrt{6}+i\sqrt{3}}{\sqrt{2}-i}$

$$\frac{\sqrt{6}+i\sqrt{3}}{\sqrt{2}-i}\cdot\frac{\sqrt{2}+i}{\sqrt{2}+i}$$

$$\frac{\sqrt{12}+i\sqrt{6}+i\sqrt{6}+i^2\sqrt{3}}{2-i^2}$$

$$\frac{2\sqrt{3}+2i\sqrt{6}-\sqrt{3}}{2+1}=\frac{\sqrt{3}+2i\sqrt{6}}{3}$$

Simplify. 6) $\dfrac{(4+3i)^2}{(3-4i)^2}$

$$\frac{16+24i+9i^2}{9-24i+16i^2}$$

$$\frac{16+24i-9}{9-24i-16}$$

$$\frac{7+24i}{-7-24i}=-1$$

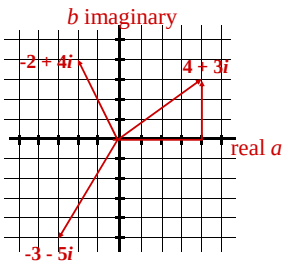
Simplify. 7) $\dfrac{1-i}{(1+i)^2}$

$$\frac{1-i}{1+2i+i^2}$$

$$\frac{1-i}{2i}\cdot\frac{i}{i}$$

$$\frac{i-i^2}{2i^2}=\frac{i+1}{-2}\ \text{or}\ \frac{-1-i}{2}$$

Graphing Complex Numbers



Graph 4 + 3*i*

Graph -2 + 4*i*

Graph -3 - 5*i*