

## Operations with Complex Numbers

**Simplify.**

1)  $i + 6i$

$7i$

2)  $3 + 4 + 6i$

$7 + 6i$

3)  $3i + i$

$4i$

4)  $-8i - 7i$

$-15i$

5)  $-1 - 8i - 4 - i$

$-5 - 9i$

6)  $7 + i + 4 + 4$

$15 + i$

7)  $-3 + 6i - (-5 - 3i) - 8i$

$2 + i$

8)  $3 + 3i + 8 - 2i - 7$

$4 + i$

9)  $4i(-2 - 8i)$

$32 - 8i$

10)  $5i \cdot -i$

$5$



11)  $5i \cdot i \cdot -2i$

$10i$

12)  $-4i \cdot 5i$

$20$

13)  $(-2 - i)(4 + i)$

$-7 - 6i$

14)  $(7 - 6i)(-8 + 3i)$

$-38 + 69i$

15)  $7i \cdot 3i(-8 - 6i)$

$168 + 126i$

16)  $(4 - 5i)(4 + i)$

$21 - 16i$

17)  $(2 - 4i)(-6 + 4i)$

$4 + 32i$

18)  $(-3 + 2i)(-6 - 8i)$

$34 + 12i$

19)  $(8 - 6i)(-4 - 4i)$

$-56 - 8i$

20)  $(1 - 7i)^2$

$-48 - 14i$

21)  $6(-7 + 6i)(-4 + 2i)$

$96 - 228i$

22)  $(-2 - 2i)(-4 - 3i)(7 + 8i)$

$-98 + 114i$

23)  $5i + 7i \cdot i$

$-7 + 5i$

24)  $(6i)^3$

$-216i$

25)  $6i \cdot -4i + 8$

$32$

26)  $-6(4 - 6i)$

$-24 + 36i$

27)  $(8 - 3i)^2$

$55 - 48i$

28)  $3 + 7i - 3i - 4$

$-1 + 4i$

29)  $-3i \cdot 6i - 3(-7 + 6i)$

$39 - 18i$

30)  $-6i(8 - 6i)(-8 - 8i)$

$-96 + 672i$

**Critical thinking questions:**

31) How are the following problems different?

Simplify:  $(2 + x)(3 - 2x)$

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

 $i^2 = -1$  so it leads to a few more steps

32) How are the following problems different?

Simplify:  $2 + x - (3 - 2x)$

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

There is no difference.

## Rationalizing Imaginary Denominators

**Simplify.**

1)  $\frac{2}{8i}$

$$-\frac{i}{4}$$

2)  $\frac{3}{5i}$

$$-\frac{3i}{5}$$

3)  $\frac{-5}{-5i}$

$$-i$$

4)  $\frac{-1}{-9i}$

$$-\frac{i}{9}$$

5)  $\frac{6}{-4i}$

$$\frac{3i}{2}$$

6)  $\frac{6+8i}{9i}$

$$\frac{-6i+8}{9}$$

7)  $\frac{4-9i}{-6i}$

$$\frac{4i+9}{6}$$

8)  $\frac{-3+10i}{-6i}$

$$\frac{-3i-10}{6}$$

9)  $\frac{-1+8i}{-i}$

$$-i-8$$

10)  $\frac{10-10i}{-5i}$

$$2i+2$$

11)  $\frac{5i}{-2-6i}$

$$\frac{-i-3}{4}$$

12)  $\frac{8i}{-1+3i}$

$$\frac{-4i+12}{5}$$

$$13) \frac{1}{-8-5i}$$

$$\frac{-8+5i}{89}$$

$$14) \frac{i}{-2-8i}$$

$$\frac{-i-4}{34}$$

$$15) \frac{4}{-3-6i}$$

$$\frac{-4+8i}{15}$$

$$16) \frac{-10-5i}{-6+6i}$$

$$\frac{5+15i}{12}$$

$$17) \frac{-5-9i}{9+8i}$$

$$\frac{-117-41i}{145}$$

$$18) \frac{-4+10i}{3+4i}$$

$$\frac{28+46i}{25}$$

$$19) \frac{-5-3i}{7-10i}$$

$$\frac{-5-71i}{149}$$

$$20) \frac{-3-7i}{7+10i}$$

$$\frac{-91-19i}{149}$$

$$21) \frac{-1+i}{-5i}$$

$$\frac{-i-1}{5}$$

$$22) \frac{-6-i}{i}$$

$$6i-1$$

$$23) \frac{2+5i}{-i}$$

$$2i-5$$

$$24) \frac{-4-4i}{4i}$$

$$i-1$$

$$25) \frac{3}{-i}$$

$$3i$$

$$26) \frac{a}{ib}$$

$$-\frac{ia}{b}$$