

10.8 Complex Numbers

Learning Objectives:

1. Write square roots of negative numbers in the form bi .
2. Add or subtract complex numbers.
3. Multiply complex numbers.
4. Divide complex numbers.
5. Raise i to powers.

Examples:

1. Write using i notation.

a) $\sqrt{-9}$

b) $\sqrt{-18}$

c) $-\sqrt{4}$

d) $5\sqrt{-20}$

Write using i notation. Then multiply or divide as indicated.

e) $\sqrt{-3} \cdot \sqrt{-7}$

f) $\sqrt{25} \cdot \sqrt{-1}$

g) $\sqrt{4} \cdot \sqrt{-64}$

h) $\frac{\sqrt{81}}{\sqrt{-6}}$

2. Add or subtract as indicated. Write your answers in $a + bi$ form.

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

b) $(8 - i) - (2 - 3i)$

c) $7 - (9 + 3i)$

3. Multiply. Write your answers in $a + bi$ form.

a) $6i \cdot 8i$

b) $-3i \cdot 5i$

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

d) $(2 + i)(1 + 4i)$

e) $(\sqrt{2} - 2i)(\sqrt{2} + 2i)$

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

4. Divide. Write your answers in $a + bi$ form.

a) $\frac{2}{i}$

b) $\frac{3}{7i}$

c) $\frac{6}{2 + 3i}$

d) $\frac{3 + 2i}{4 - 3i}$

5. Find each power of i .

a) i^3

b) i^4

c) i^5

d) i^6

e) i^{27}

f) $(-2i)^5$

Answers: 1a) $3i$; b) $3i\sqrt{2}$; c) -2 ; d) $10i\sqrt{5}$; e) $-\sqrt{21}$; f) $5i$; g) $16i$; h) $-\frac{3}{2}i\sqrt{6}$; 2a) $5-i$; b) $6+2i$; c) $-2-3i$;

3a) -48 ; b) 15 ; c) $18+8i$; d) $-2+9i$; e) 6 ; f) $5-12i$; 4a) $-2i$; b) $-\frac{3}{7}i$; c) $\frac{12}{13}-\frac{18}{13}i$; d) $\frac{6}{25}+\frac{17}{25}i$; 5a) $-i$; b) 1 ; c) i ; d) -1 ; e) $-i$; f) $-32i$