23.3   Exercises

Exercise 23.1

Plot the complex numbers in the complex plane.

a) $4 + 2i$ b) $-3 - 5i$ c) $6 - 2i$ d) $-5 + i$ e) $-2i$
f) $\sqrt{2} - \sqrt{2}i$ g) 7 h) i i) 0 j) $2i - \sqrt{3}$

Exercise 23.2

Add, subtract, multiply, and divide as indicated.

a) $(5 - 2i) + (-2 + 6i)$ b) $(-9 - i) - (5 - 3i)$
c) $(3 + 2i) \cdot (4 + 3i)$ d) $(-2 - i) \cdot (-1 + 4i)$
e) $\frac{2+3i}{2+i}$ f) $(5 + 5i) \div (2 - 4i)$

Exercise 23.3

Find the absolute value $|a+bi|$ of the given complex number, and simplify
your answer as much as possible.

a) $|4 + 3i|$ b) $|6 - 6i|$ c) $|-3i|$ d) $|-2 - 6i|$
e) $|\sqrt{8} - i|$ f) $|-2\sqrt{3} - 2i|$ g) $|-5|$ h) $|-\sqrt{17} + 4\sqrt{2}i|$

Exercise 23.4

Convert the complex number into polar form $r(\cos(\theta) + i\sin(\theta))$.

a) $2 + 2i$ b) $4\sqrt{3} - 4i$ c) $-7 + 7\sqrt{3}i$ d) $-5 - 5i$
e) $8 - 8i$ f) $-8 + 8i$ g) $-\sqrt{5} - \sqrt{15}i$ h) $\sqrt{7} - \sqrt{21}i$
i) $-5 - 12i$ j) $6i$ k) -10 l) $-\sqrt{3} + 3i$

Exercise 23.5

Convert the complex number into the standard form $a + bi$.

a) $6(\cos(150°) + i\sin(150°))$ b) $10(\cos(315°) + i\sin(315°))$
c) $2(\cos(90°) + i\sin(90°))$ d) $\cos(\frac{\pi}{6}) + i\sin(\frac{\pi}{6})$
e) $\frac{1}{2}(\cos(\frac{7\pi}{6}) + i\sin(\frac{7\pi}{6}))$ f) $6(\cos(-\frac{5\pi}{12}) + i\sin(-\frac{5\pi}{12}))$

Exercise 23.6

Multiply the complex numbers and write the answer in standard form $a + bi$.

✓a) $4(\cos(27°) + i\sin(27°)) \cdot 10(\cos(123°) + i\sin(123°))$

✓b) $7(\cos(182°) + i\sin(182°)) \cdot 6(\cos(43°) + i\sin(43°))$

✓c) $(\cos(\frac{13\pi}{12}) + i\sin(\frac{13\pi}{12})) \cdot (\cos(\frac{7\pi}{12}) + i\sin(\frac{7\pi}{12}))$

✓d) $8(\cos(\frac{3\pi}{7}) + i\sin(\frac{3\pi}{7})) \cdot 1.5(\cos(\frac{4\pi}{7}) + i\sin(\frac{4\pi}{7}))$

e) $0.2(\cos(196°) + i\sin(196°)) \cdot 0.5(\cos(88°) + i\sin(88°))$

f) $4(\cos(\frac{7\pi}{8}) + i\sin(\frac{7\pi}{8})) \cdot 0.25(\cos(\frac{-5\pi}{24}) + i\sin(\frac{-5\pi}{24}))$

Exercise 23.7

Divide the complex numbers and write the answer in standard form $a+bi$.

✓a) $\dfrac{18(\cos(320°) + i\sin(320°))}{3(\cos(110°) + i\sin(110°))}$

✓b) $\dfrac{10(\cos(207°) + i\sin(207°))}{15(\cos(72°) + i\sin(72°))}$

✓c) $\dfrac{7(\cos(\frac{11\pi}{15}) + i\sin(\frac{11\pi}{15}))}{3(\cos(\frac{\pi}{15}) + i\sin(\frac{\pi}{15}))}$

✓d) $\dfrac{\cos(\frac{8\pi}{5}) + i\sin(\frac{8\pi}{5})}{2(\cos(\frac{\pi}{10}) + i\sin(\frac{\pi}{10}))}$

e) $\dfrac{42(\cos(\frac{7\pi}{4}) + i\sin(\frac{7\pi}{4}))}{7(\cos(\frac{5\pi}{12}) + i\sin(\frac{5\pi}{12}))}$

f) $\dfrac{30(\cos(-175°) + i\sin(-175°))}{18(\cos(144°) + i\sin(144°))}$