H.W. (1):

Q1. Show that:

a) $(-1+i)^7 = -8(1+i)$ b) $(1+\sqrt{3}i)^{-10} = 2^{-11}(-1+\sqrt{3}i)$

Q2- Solve the following equations:

a) $Z^5 = 4-4i$ b) $z = \sqrt[6]{2}$

Q3- Find the principal argument when

a) $Z = \frac{i}{-2-2i}$ b) $z = (\sqrt{3}-i)^6$

Q4- Reduce each of these quantities to a real number:

a) $\frac{1+2i}{3-4i} + \frac{2-i}{5i}$ b) $\frac{5i}{(1-i)(2-i)(3-i)}$

Q5- Simplify the complex numbers.

a) $\frac{6+\sqrt{-18}}{9}$ b) $\frac{4-\sqrt{-36}}{2}$

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EXERCISES 1.1

1. Evaluate the following powers of i.

   (a) i^8 (b) i^{11}

2. Write the given number in the form $a + ib$.

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

In Problems 3–20, write the given number in the form $a + ib$.

3. $(5 - 9i) + (2 - 4i)$

9. $3i + \dfrac{1}{2 - i}$

11. $\dfrac{2 - 4i}{3 + 5i}$

14. $\dfrac{(1 + i)(1 - 2i)}{(2 + i)(4 - 3i)}$

15. $\dfrac{(5 - 4i) - (3 + 7i)}{(4 + 2i) + (2 - 3i)}$

In Problems 25 and 26, find $\mathrm{Re}(z)$ and $\mathrm{Im}(z)$.

25. $z = \left(\dfrac{i}{3 - i}\right)\left(\dfrac{1}{2 + 3i}\right)$

EXERCISES 1.2

In Problems 9–12, find the modulus of the given complex number.

9. $(1-i)^2$

11. $\dfrac{2i}{3-4i}$

EXERCISES 1.3

In Problems 1–10, write the given complex number in polar form first using an argument $\theta \neq \text{Arg}(z)$ and then using $\theta = \text{Arg}(z)$.

9. $\dfrac{3}{-1+i}$

12. $-12-5i$

In Problems 15–18, write the complex number whose polar form is given in the form $a+ib$. Use a calculator if necessary.

17. $z = 6\left(\cos\dfrac{\pi}{8} + i\sin\dfrac{\pi}{8}\right)$

In Problems 19 and 20 find z_1z_2 and z_1/z_2. Write the number in the form $a+ib$.

20. $z_1 = \sqrt{2}\left(\cos\dfrac{\pi}{4} + i\sin\dfrac{\pi}{4}\right)$, $z_2 = \sqrt{3}\left(\cos\dfrac{\pi}{12} + i\sin\dfrac{\pi}{12}\right)$

In Problems 21–24, write each complex number in polar form.

to obtain the polar form of the given number. Finally, write the polar form in the form $a+ib$.

21. $(3-3i)(5+5\sqrt{3}i)$

In Problems 25–30, use (9) to compute the indicated powers.

30. $\left[\sqrt{3}\left(\cos\dfrac{2\pi}{9} + i\sin\dfrac{2\pi}{9}\right)\right]^6$

EXERCISES 1.4

In Problems 1–14, use (4) to compute all roots. Give the principal nth root

14. $\left(\dfrac{1+i}{\sqrt{3}+i}\right)^{1/6}$

EXERCISES 1.5

In Problems 1–12, sketch the graph of the given equation in the complex plane.

1. $|z - 4 + 3i| = 5$

3. $|z + 3i| = 2$

5. $\mathrm{Re}(z) = 5$

In Problems 13–24, sketch the set S of points in the complex plane satisfying the given inequality. Determine whether the set is (**a**) open, (**b**) closed, (**c**) a domain, (**d**) bounded, or (**e**) connected.

13. $\mathrm{Re}(z) < -1$

17. $2 < \mathrm{Re}(z - 1) < 4$

21. $|z - i| > 1$

23. $1 \leq |z - 1 - i| < 2$