16. $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$

17. $\begin{bmatrix} \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & 0 & -\frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{6}} \end{bmatrix}$

18. λ is an eigenvalue of A if there exists a nonzero vector $\mathbf{x}$ such that $A\mathbf{x} = \lambda\mathbf{x}$. $\mathbf{x}$ is called an eigenvector of A. If A is an $n \times n$ matrix, then A can have n eigenvalues, possibly complex and possibly repeated.

19. P is orthogonal if $P^{-1} = P^T$. The possible eigenvalues of an orthogonal matrix are 1 and -1.

20. There exists P such that $P^{-1}AP = D$. A and B are similar implies that there exists Q such that $A = Q^{-1}BQ$. Then $D = P^{-1}AP = P^{-1}(Q^{-1}BQ)P = (QP)^{-1}A(QP)$.

21. If 0 is an eigenvalue of A, then $|A - \lambda I| = |A| = 0$, and hence A is singular.

22. Let λ_1 and λ_2 be distinct eigenvalues of A, with corresponding eigenvectors $\mathbf{x}_1$ and $\mathbf{x}_2$. Then we can write

$$\begin{aligned}\lambda_1(\mathbf{x}_1 \cdot \mathbf{x}_2) &= (\lambda_1\mathbf{x}_1) \cdot \mathbf{x}_2 \\ &= (A\mathbf{x}_1) \cdot \mathbf{x}_2 \\ &= (A\mathbf{x}_1)^T \mathbf{x}_2 \\ &= (\mathbf{x}_1^T A^T)\, \mathbf{x}_2 \\ &= (\mathbf{x}_1^T A)\, \mathbf{x}_2 \\ &= \mathbf{x}_1^T(A\mathbf{x}_2) \\ &= \mathbf{x}_1^T(\lambda_2\mathbf{x}_2) \\ &= \mathbf{x}_1 \cdot (\lambda_2\mathbf{x}_2) = \lambda_2(\mathbf{x}_1 \cdot \mathbf{x}_2)\end{aligned}$$

This implies that $(\lambda_1 - \lambda_2)(\mathbf{x}_1 \cdot \mathbf{x}_2) = 0$, and because $\lambda_1 \neq \lambda_2$, it follows that $\mathbf{x}_1 \cdot \mathbf{x}_2 = 0$. Therefore, $\mathbf{x}_1$ and $\mathbf{x}_2$ are orthogonal.

23. The range of T is nonempty because it contains **0.** Let $T(\mathbf{u})$ and $T(\mathbf{v})$ be two vectors in the range of T. Then $T(\mathbf{u}) + T(\mathbf{v}) = T(\mathbf{u} + \mathbf{v})$. But since $\mathbf{u}$ and $\mathbf{v}$ are in V, it follows that $\mathbf{u} + \mathbf{v}$ is also in V, which in turn implies that $T(\mathbf{u} + \mathbf{v})$ is in the range.

Similarly, let $T(\mathbf{u})$ be in the range of T, and let c be a scalar. Then $cT(\mathbf{u}) = T(c\mathbf{u})$. But since $c\mathbf{u}$ is in V, this implies that $T(c\mathbf{u})$ is in the range.

24. If T is one-to-one and $\mathbf{v}$ is in the kernel, then $T(\mathbf{v}) = T(\mathbf{0}) = \mathbf{0}$, which implies that $\mathbf{v} = \mathbf{0}$. Conversely, if the kernel of T is $\{\mathbf{0}\}$ and $T(\mathbf{v}) = T(\mathbf{u})$, then $T(\mathbf{v} - \mathbf{u}) = \mathbf{0}$, which implies that $\mathbf{v} - \mathbf{u}$ is in the kernel. Since the kernel is trivial, $\mathbf{v} = \mathbf{u}$.

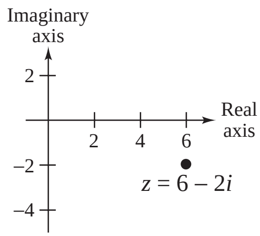
25. 0 is the only eigenvalue.

Chapter 8

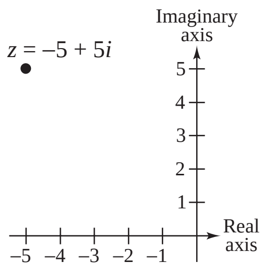
SECTION 8.1 (*page 438)*

1. $-\sqrt{6}$ **3.** -4 **5.** 1

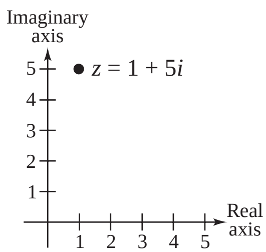
7.



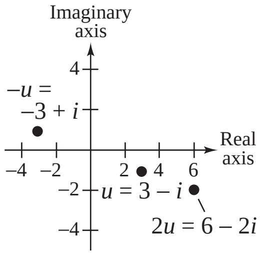
9.



11.

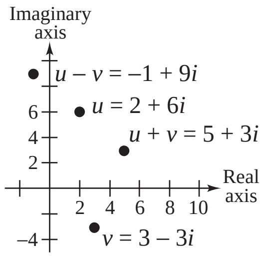


13.

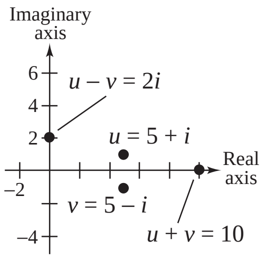


15. $x = 6$ **17.** $x = 3$

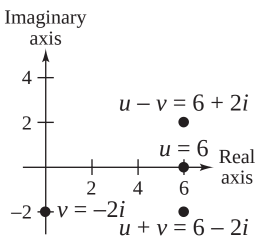
19. Sum: $5 + 3i$
Difference: $-1 + 9i$



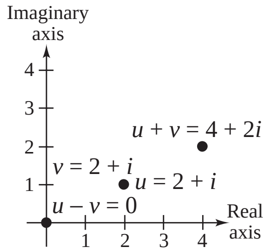
21. Sum: 10
Difference: $2i$



23. Sum: $6 - 2i$
Difference: $6 + 2i$



25. Sum: $4 + 2i$
Difference: 0



27. $20 + 10i$ **29.** 8

31. $(a^2 - b^2) + 2abi$ **33.** $-2 + 2i$

35. $(a^3 - 3ab^2) + (3a^2b - b^3)i$

37. $-\frac{1}{2} \pm \frac{3}{2}i$ **39.** 2, 3 **41.** $1, 1 \pm i$

43. $\pm 2, \pm 2i$ **45.** $\begin{bmatrix} 2 & 1 + 3i \\ -1 - 2i & -4i \end{bmatrix}$

47. $\begin{bmatrix} 2 + 2i & 2 \\ 4 - 4i & -6i \end{bmatrix}$ **49.** $\begin{bmatrix} -2 + 2i & 2i \\ 4 + 4i & 6 \end{bmatrix}$

51. $-5 - 3i$ **53.** $\begin{bmatrix} -5 & -15 + 10i \\ 25i & 15 + 30i \end{bmatrix}$

57. (a) $A^1 = A = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$, $A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$,

$A^3 = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$, $A^4 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$,

$A^5 = A = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

(b) $A^{57} = A = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$, $A^{1995} = A^3 = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$

(c) $A^n = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$, if $n = 1, 5, \ldots, 4k + 1$

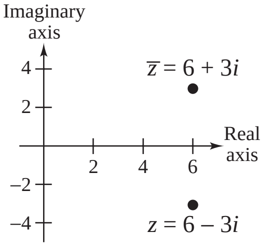
$A^n = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$, if $n = 2, 6, \ldots, 4k + 2$

$A^n = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$, if $n = 3, 7, \ldots, 4k + 3$

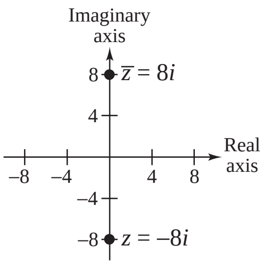
$A^n = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, if $n = 4, 8, \ldots, 4k$

SECTION 8.2 *(page 444)*

1. $6 + 3i$



3. $8i$



5. $\sqrt{5}$ **7.** $\sqrt{65}$ **9.** 5

11. $|wz| = |-3 + i| = \sqrt{10}$
$|w|\,|z| = \sqrt{5}\sqrt{2} = \sqrt{10}$
$|zw| = |-3 + i| = \sqrt{10}$

13. $1 - 2i$ **15.** $\frac{7}{11} - \frac{6\sqrt{2}}{11}i$

17. $\frac{13}{10} + \frac{9}{10}i$

19. (a) $3 - 4i$ (b) $2 - 11i$
(c) $\frac{2}{5} + \frac{1}{5}i$ (d) $\frac{3}{25} + \frac{4}{25}i$

21. $A^{-1} = -\frac{1}{3}\begin{bmatrix} i & -3i \\ -2 + i & 6 \end{bmatrix}$ **23.** Not invertible

25. $A^{-1} = \frac{1}{2}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 + i & 0 \\ 0 & 0 & 1 - i \end{bmatrix}$ **27** $-\frac{5}{3} - \frac{10}{3}i$

29. (a) Circle of radius 3 centered at origin.
(b) Circle of radius 5 centered at $1 - i$.
(c) Interior and boundary of circle of radius 2 centered at i.
(d) Closed region between the concentric circles of radii 2 and 5 centered at the origin.

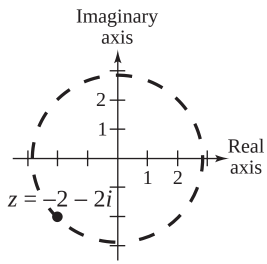
33. (a) $(1/i)^1 = 1/i = -i$, $(1/i)^2 = -1$, $(1/i)^3 = i$, $(1/i)^4 = 1$, $(1/i)^5 = -i$
(b) $(1/i)^{57} = -i$, $(1/i)^{1995} = i$
(c) $(1/i)^n = -i$, for $i = 1, 5, \ldots, 4k + 1$
$(1/i)^n = -1$, for $i = 2, 6, \ldots, 4k + 2$
$(1/i)^n = i$, for $i = 3, 7, \ldots, 4k + 3$
$(1/i)^n = 1$, for $i = 4, 8, \ldots, 4k$

SECTION 8.3 (*page 453*)

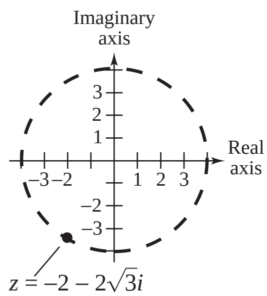
1. $\sqrt{8}\left[\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right)\right]$

3. $6(\cos\pi + i\sin\pi)$

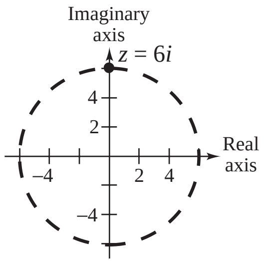
5. $\sqrt{8}\left[\cos\left(-\frac{3\pi}{4}\right) + i\sin\left(-\frac{3\pi}{4}\right)\right]$



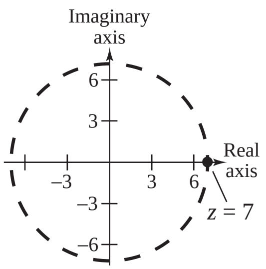
7. $4\left[\cos\left(-\frac{2\pi}{3}\right) + i\sin\left(-\frac{2\pi}{3}\right)\right]$



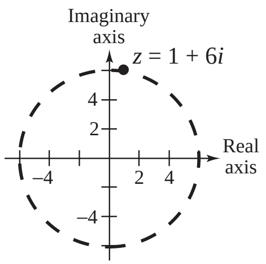
9. $6\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$



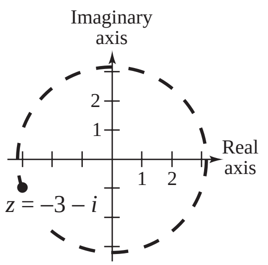
11. $7(\cos 0 + i\sin 0)$



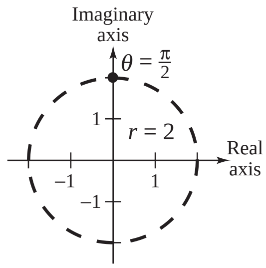
13. $\sqrt{37}(\cos 1.4056 + i\sin 1.4056)$



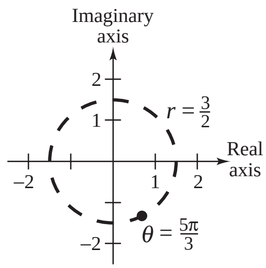
15. $\sqrt{10}[\cos(-2.82) + i\sin(-2.82)$



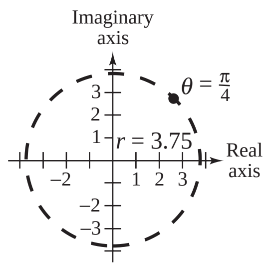
17. $2i$



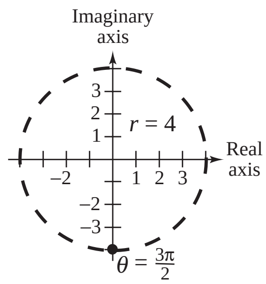
19. $\frac{3}{4} - \frac{3\sqrt{3}}{4}i$



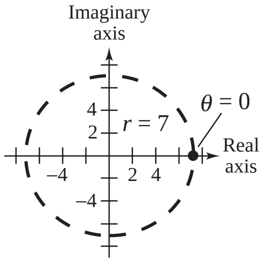
21. $\frac{15\sqrt{2}}{8} + \frac{15\sqrt{2}}{8}i$



23. $-4i$



25. 7



27. $12\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}\right)$

29. $0.25(\cos 0 + i \sin 0)$

31. $\frac{1}{2}\left(\cos \frac{4\pi}{9} + i \sin \frac{4\pi}{9}\right)$

33. $4\left(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6}\right)$

35. -4

37. $-32i$

39. -8

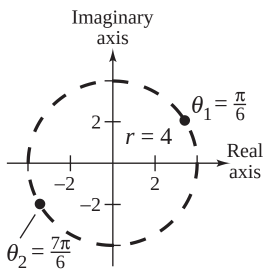
41. $-\frac{81}{2} - \frac{81\sqrt{3}}{2}i$

43. 256

45. (a) $4\left(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6}\right)$

$4\left(\cos \frac{7\pi}{6} + i \sin \frac{7\pi}{6}\right)$

(b)



(c) $2\sqrt{3} + 2i$

$-2\sqrt{3} - 2i$

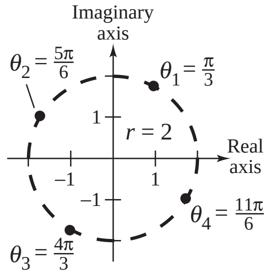
47. (a) $2\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}\right)$

$2\left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}\right)$

$2\left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3}\right)$

$2\left(\cos \frac{11\pi}{6} + i \sin \frac{11\pi}{6}\right)$

(b)



(c) $1 + \sqrt{3}i$

$-\sqrt{3} + i$

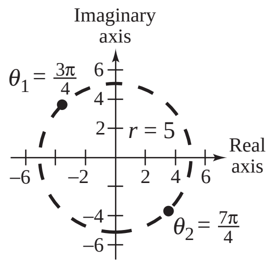
$-1 - \sqrt{3}i$

$\sqrt{3} - i$

49. (a) $5\left(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4}\right)$

$5\left(\cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4}\right)$

(b)



(c) $-\frac{5\sqrt{2}}{2} + \frac{5\sqrt{2}}{2}i$

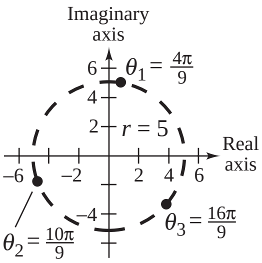
$\frac{5\sqrt{2}}{2} - \frac{5\sqrt{2}}{2}i$

51. (a) $5\left(\cos \frac{4\pi}{9} + i \sin \frac{4\pi}{9}\right)$

$5\left(\cos \frac{10\pi}{9} + i \sin \frac{10\pi}{9}\right)$

$5\left(\cos \frac{16\pi}{9} + i \sin \frac{16\pi}{9}\right)$

(b)



(c) $0.868 + 4.92i$

$-4.70 - 1.71i$

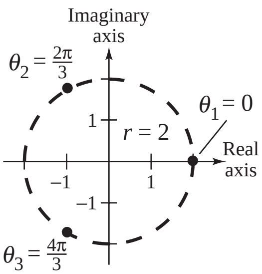
$3.83 - 3.21i$

53. (a) $2(\cos 0 + i \sin 0)$

$2\left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3}\right)$

$2\left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3}\right)$

(b)



(c) 2

$-1 + \sqrt{3}\,i$

$-1 - \sqrt{3}\,i$

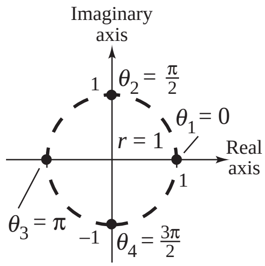
55. (a) $\cos 0 + i \sin 0$

$\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}$

$\cos \pi + i \sin \pi$

$\cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2}$

(b)



(c) 1

i

-1

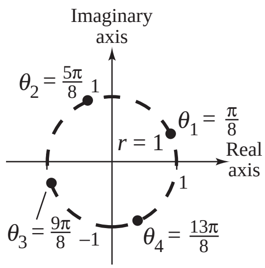
$-i$

57. $\cos \frac{\pi}{8} + i \sin \frac{\pi}{8}$

$\cos \frac{5\pi}{8} + i \sin \frac{5\pi}{8}$

$\cos \frac{9\pi}{8} + i \sin \frac{9\pi}{8}$

$\cos \frac{13\pi}{8} + i \sin \frac{13\pi}{8}$



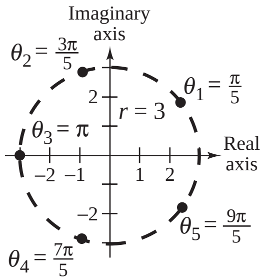
59. $3\left(\cos \frac{\pi}{5} + i \sin \frac{\pi}{5}\right)$

$3\left(\cos \frac{3\pi}{5} + i \sin \frac{3\pi}{5}\right)$

$3(\cos \pi + i \sin \pi)$

$3\left(\cos \frac{7\pi}{5} + i \sin \frac{7\pi}{5}\right)$

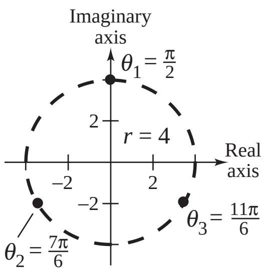
$3\left(\cos \frac{9\pi}{5} + i \sin \frac{9\pi}{5}\right)$



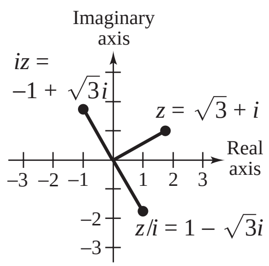
61. $4\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$

$4\left(\cos\frac{7\pi}{6} + i\sin\frac{7\pi}{6}\right)$

$4\left(\cos\frac{11\pi}{6} + i\sin\frac{11\pi}{6}\right)$



67.



SECTION 8.4 (*page 461*)

1. $(3i, 9 - 3i)$ **3.** $(-8 + 4i, 6 + 12i)$

5. $(-5 + i, -4)$ **7.** $(-9 + 3i, 2 + 14i)$

9. S is *not* a basis for C^2 **11.** S *is* a basis for C^3

13. (a) $(1, 2, 0) = i(i, 0, 0) - 2i(i, i, 0) + 0(i, i, i)$
(b) $(1, 2, 0) = -(1, 0, 0) + 2(1, 1, 0) + 0(0, 0, 1 + i)$

15. (a) $(-i, 2 + i, -1) = (-2 + 2i)(i, 0, 0) + (1 - 3i)(i, i, 0) + i(i, i, i)$
(b) $(-i, 2 + i, -1) = (-2 - 2i)(1, 0, 0) + (2 + i)(1, 1, 0) + \left(-\frac{1}{2} + \frac{1}{2}i\right)(0, 0, 1 + i)$

17. $\sqrt{2}$ **19.** $3\sqrt{42}$ **21.** $\sqrt{7}$

23. $\sqrt{17}$ **25.** $\sqrt{3}$ **27.** $\sqrt{15}$

29. $\sqrt{2}$ **31.** Linearly dependent

33. Linearly independent

35. Not a complex inner product

37. Is a complex inner product

39. $z_3 = 0$, z_1 and z_2 can be any complex numbers.

47. $T\begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \begin{bmatrix} 2 + i & 0 \\ 1 & -i \end{bmatrix}\begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$

49. $\begin{bmatrix} 1 + i \\ 2i \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ **51.** $\begin{bmatrix} 2 - i \\ 1 + 2i \\ -1 + 5i \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

53. $\ker = \{(0, 0)\}$ **55.** $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$

57. (a), (b), and (d) are subspaces.

SECTION 8.5 (*page 471*)

1. $A^* = \begin{bmatrix} -i & 2 \\ i & -3i \end{bmatrix}$ **3.** $A^* = \begin{bmatrix} 0 & 2 \\ 1 & 0 \end{bmatrix}$

5. $A^* = \begin{bmatrix} 0 & 5 + i & \sqrt{2}i \\ 5 - i & 6 & 4 \\ -\sqrt{2}i & 4 & 3 \end{bmatrix}$

7. $A^* = [7 - 5i \quad -2i \quad 4]$

9. A is not unitary because it is singular.

11. A is not unitary because it is not a square matrix.

13. $AA^* = \begin{bmatrix} 4 & 4i \\ -4i & 4 \end{bmatrix} \neq I_2$

Hence, A is not unitary.

15. $AA^* = I_n$

Hence, A is unitary.

17. $AA^* = \begin{bmatrix} 1 & 0 & \frac{1}{6} \\ 0 & 1 & \frac{1}{6} \\ \frac{1}{6} & \frac{1}{6} & \frac{1}{2} \end{bmatrix} \neq I_3$

Hence, A is not unitary.

19. (a) $r_1 = (-\frac{4}{5}, \frac{3}{5}i), r_2 = (\frac{3}{5}, \frac{4}{5}i)$

$\|r_1\| = 1, \|r_2\| = 1, r_1 \cdot r_2 = 0$

(b) $A^{-1} = \begin{bmatrix} -\frac{4}{5} & \frac{3}{5} \\ -\frac{3}{5}i & -\frac{4}{5}i \end{bmatrix}$

21. (a) $r_1 = \dfrac{1}{2\sqrt{2}}(\sqrt{3} - i, 1 + \sqrt{3}i),$

$r_2 = \dfrac{1}{2\sqrt{2}}(\sqrt{3} + i, 1 - \sqrt{3}i)$

$\|r_1\| = 1, \|r_2\| = 1, r_1 \cdot r_2 = 0$

(b) $A^{-1} = \dfrac{1}{2\sqrt{2}} \begin{bmatrix} \sqrt{3} + i & \sqrt{3} - i \\ 1 - \sqrt{3}i & 1 + \sqrt{3}i \end{bmatrix}$

23. A is not Hermitian because the entry a_{22}, on the main diagonal, is not a real number. Hence $A \neq A^*$.

25. A is Hermitian because $A = A^*$.

27. A is Hermitian because $A = A^*$.

29. $\lambda_1 = 1$, $\lambda_2 = -1$

31. $\lambda_1 = 1$, $\lambda_2 = 4$

33. $\lambda_1 = 1$, $\lambda_2 = 2$, $\lambda_3 = 3$

35. $\mathbf{v}_1 = (1, -i)$, $\mathbf{v}_2 = (1, i)$

37. $\mathbf{v}_1 = (\sqrt{2}, -i, i)$, $\mathbf{v}_2 = (0, 1, 1)$, $\mathbf{v}_3 = (\sqrt{2}, i, -i)$

39. $P = \dfrac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ -i & i \end{bmatrix}$

41. $P = \dfrac{1}{2} \begin{bmatrix} \sqrt{2} & 0 & \sqrt{2} \\ -i & \sqrt{2} & i \\ i & \sqrt{2} & -i \end{bmatrix}$

43. $P = \dfrac{1}{\sqrt{6}} \begin{bmatrix} \sqrt{6} & 0 & 0 \\ 0 & -1 + i & 2 \\ 0 & 2 & 1 + i \end{bmatrix}$

45. $A = \dfrac{1}{\sqrt{2}} \begin{bmatrix} -1 & -1 \\ -i & i \end{bmatrix}$

47. $A = \dfrac{1}{\sqrt{2}} \begin{bmatrix} i & -i \\ -1 & -1 \end{bmatrix}$

57. (a) $A = \dfrac{A + \bar{A}}{2} + i\dfrac{A - \bar{A}}{2i}$

(b) $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} + i\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

(c) $A = \dfrac{A + A^*}{2} + i\dfrac{A - A^*}{2i}$

(d) $\begin{bmatrix} 0 & 2 - \frac{i}{2} \\ 2 + \frac{i}{2} & 1 \end{bmatrix} + i\begin{bmatrix} 1 & \frac{1}{2} \\ \frac{1}{2} & -2 \end{bmatrix}$

Review Exercises – Chapter 8 (*page 473*)

1. 2

3. 20

5. $\frac{4}{3} + \frac{2}{3}i$

7. $2 \pm 2i$

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

11. $\begin{bmatrix} 5 & 2 + i \\ 3 + 2i & 5 + 2i \end{bmatrix}$

13. $-1 + 5i$

15. $-1 - 2i$

17. $\sqrt{8}$

19. $8 + 4i$

21. $\frac{3}{5} + \frac{4}{5}i$

23. $\frac{5}{6} + \frac{5}{6}i$

25. A is singular.

27. $4\sqrt{2}\left(\cos \dfrac{\pi}{4} + i \sin \dfrac{\pi}{4}\right)$

29. $\sqrt{65}[\cos(-0.519) + i \sin(-0.519)]$

31. $\dfrac{5\sqrt{3}}{2} - \dfrac{5}{2}i$

33. $-3 + 3\sqrt{3}i$

35. $12\left(\cos \dfrac{2\pi}{3} + i \sin \dfrac{2\pi}{3}\right)$

37. $\frac{3}{2}\left[\cos\left(-\dfrac{\pi}{6}\right) + i \sin\left(-\dfrac{\pi}{6}\right)\right]$

39. $4(\cos \pi + i \sin \pi)$

41. $8\sqrt{2}\left[\cos\left(-\frac{5\pi}{6}\right) + i\sin\left(-\frac{5\pi}{6}\right)\right]$

43. $5\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right) = \frac{5}{2} + \frac{5\sqrt{3}}{2i}$

$5\left(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}\right) = -\frac{5}{2} - \frac{5\sqrt{3}}{2i}$

45. $\cos\frac{\pi}{6} + i\sin\frac{\pi}{6} = \frac{\sqrt{3}}{2} + \frac{1}{2}i$

$\cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6} = -\frac{\sqrt{3}}{2} + \frac{1}{2}i$

$\cos\frac{3\pi}{2} + i\sin\frac{3\pi}{2} = i$

47. $A^* = \begin{bmatrix} -1-4i & 3+i \\ 3-i & 2-i \end{bmatrix}$

49. $(-3 + 28i, 14 + 8i)$ **51.** $(-5, 1 - 2i)$

53. $\sqrt{38}$ **55.** 4 **57.** Unitary

59. Not unitary **61.** Not Hermitian

63. $\lambda_1 = -1, \mathbf{v}_1 = (-2 + i, 5)$

$\lambda_2 = 5, \mathbf{v}_2 = (5, 2 + i)$

CHAPTER 8 MATLAB (*page 476*)

1. (a) $\begin{bmatrix} -8+7i & 3-2i \\ -3+2i & 9+4i \end{bmatrix}$

(b) $\begin{bmatrix} -3 & 3 & 0 \\ 6i & 0 & -9+6i \end{bmatrix}$

(c) $\begin{bmatrix} 0.0385 - 0.1923i & 0.4231 - 0.1154i \\ 0.3462 + 0.2692i & -0.1923 - 0.0385i \end{bmatrix}$

(d) $\begin{bmatrix} 5 & -1 & 4+6i \\ -1 & 1 & 0 \\ 4-6i & 0 & 13 \end{bmatrix}$

(e) $11 - 8i$

(f) $\begin{bmatrix} 18-35i & -23-32i \\ 23-44i & 18-25i \end{bmatrix}$

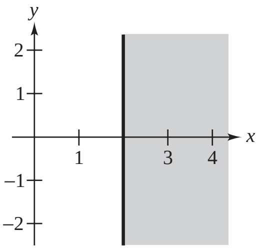
3. (a) Neither (b) Normal
(c) Neither (d) Normal

Chapter 9

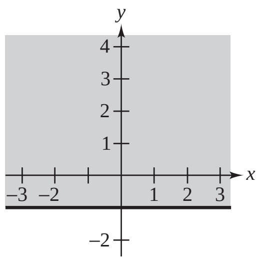
SECTION 9.1 (*page 484*)

1. f **3.** a **5.** b

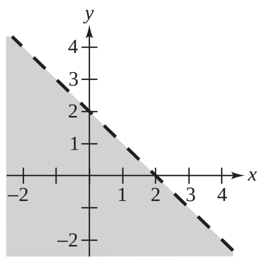
7.



9.



11.



13.