

SECTION 4.3

1. (a) F (b) T (c) F (d) T (e) F (f) T (g) F (h) F

3. (4, -3, 0) 5. (-20, -48, -8) 7. (0, -12, 16)

24. $t^n + a_{n-1}t^{n-1} + \dots + a_1t + a_0$

26. (a) $\begin{pmatrix} A_{22} & -A_{12} \\ -A_{21} & A_{11} \end{pmatrix}$ (c) $\begin{pmatrix} 10 & 0 & 0 \\ 0 & -20 & 0 \\ 0 & 0 & -8 \end{pmatrix}$

(e) $\begin{pmatrix} -3i & 0 & 0 \\ 4 & -1+i & 0 \\ 10+16i & -5-3i & 3+3i \end{pmatrix}$ (g) $\begin{pmatrix} 18 & 28 & -6 \\ -20 & -21 & 37 \\ 48 & 14 & -16 \end{pmatrix}$

SECTION 4.4

1. (a) T (b) T (c) T (d) F (e) F (f) T
-
- (g) T (h) F (i) T (j) T (k) T

2. (a) 22 (c) $2 - 4i$

3. (a) -12 (c) -12 (e) 22 (g) -3

4. (a) 0 (c) -49 (e) $-28 - i$ (g) 95

SECTION 4.5

1. (a) F (b) T (c) T (d) F (e) F (f) T

3. No 5. Yes 7. Yes 9. No

CHAPTER 5

SECTION 5.1

1. (a) F (b) T (c) T (d) F (e) F (f) F
-
- (g) F (h) T (i) T (j) F (k) F

2. (a) $[T]_\beta = \begin{pmatrix} 0 & 2 \\ -1 & 0 \end{pmatrix}$, no (c) $[T]_\beta = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$, yes

(e) $[T]_\beta = \begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$, no

3. (a) The eigenvalues are 4 and -1, a basis of eigenvectors is

$$\left\{ \begin{pmatrix} 2 \\ 3 \end{pmatrix}, \begin{pmatrix} 1 \\ -1 \end{pmatrix} \right\}, Q = \begin{pmatrix} 2 & 1 \\ 3 & -1 \end{pmatrix}, \text{ and } D = \begin{pmatrix} 4 & 0 \\ 0 & -1 \end{pmatrix}.$$

- (c) The eigenvalues are 1 and -1, a basis of eigenvectors is

$$\left\{ \begin{pmatrix} 1 \\ 1-i \end{pmatrix}, \begin{pmatrix} 1 \\ -1-i \end{pmatrix} \right\}, Q = \begin{pmatrix} 1 & 1 \\ 1-i & -1-i \end{pmatrix}, \text{ and } D = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}.$$

4. (a)
- $\lambda = 3, 4$
- $\beta = \{(3, 5), (1, 2)\}$
-
- (b)
- $\lambda = -1, 1, 2$
- $\beta = \{(1, 2, 0), (1, -1, -1), (2, 0, -1)\}$
-
- (f)
- $\lambda = 1, 3$
- $\beta = \{-2 + x, -4 + x^2, -8 + x^3, x\}$

(h) $\lambda = -1, 1, 1, 1$ $\beta = \left\{ \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix} \right\}$

(i) $\lambda = 1, 1, -1, -1$ $\beta = \left\{ \begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ 0 & 1 \end{pmatrix} \right\}$

(j) $\lambda = -1, 1, 5$ $\beta = \left\{ \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \right\}$

26. 4

SECTION 5.2

1. (a) F (b) F (c) F (d) T (e) T (f) F
-
- (g) T (h) T (i) F

2. (a) Not diagonalizable (c) $Q = \begin{pmatrix} 1 & 4 \\ 1 & -3 \end{pmatrix}$

(e) Not diagonalizable (g) $Q = \begin{pmatrix} 1 & 1 & 1 \\ 2 & -1 & 0 \\ -1 & 0 & -1 \end{pmatrix}$

3. (a) Not diagonalizable (c) Not diagonalizable

(d) $\beta = \{x - x^2, 1 - x - x^2, x + x^2\}$ (e) $\beta = \{(1, 1), (1, -1)\}$

7. $A^n = \frac{1}{3} \begin{pmatrix} 5^n + 2(-1)^n & 2(5^n) - 2(-1)^n \\ 5^n - (-1)^n & 2(5^n) + (-1)^n \end{pmatrix}$

14. (b) $x(t) = c_1 e^{3t} \begin{pmatrix} -2 \\ 1 \end{pmatrix} + c_2 e^{-2t} \begin{pmatrix} 1 \\ -1 \end{pmatrix}$

(c) $x(t) = e^t \left[c_1 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + c_2 \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \right] + c_3 e^{2t} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$

SECTION 5.3

1. (a) T (b) T (c) F (d) F (e) T (f) T
-
- (g) T (h) F (i) F (j) T

2. (a) $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ (c) $\begin{pmatrix} \frac{7}{13} & \frac{7}{13} \\ \frac{6}{13} & \frac{6}{13} \end{pmatrix}$ (e) No limit exists.

(g) $\begin{pmatrix} -1 & 0 & -1 \\ -4 & 1 & -2 \\ 2 & 0 & 2 \end{pmatrix}$ (i) No limit exists.

6. One month after arrival, 25% of the patients have recovered, 20% are ambulatory, 41% are bedridden, and 14% have died. Eventually
- $\frac{59}{90}$
- recover and
- $\frac{31}{90}$
- die.