

2 Put the eigenvectors in  $S$  and eigenvalues in  $\Lambda$ .  $A = S\Lambda S^{-1} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix}$ .

4 (a) False: don't know  $\lambda$ 's (b) True (c) True (d) False: need eigenvectors of  $S$

11 (a) *True* (no zero eigenvalues) (b) *False* (repeated  $\lambda = 2$  may have only one line of eigenvectors) (c) *False* (repeated  $\lambda$  may have a full set of eigenvectors)

12 (a) False: don't know  $\lambda$  (b) True: an eigenvector is missing (c) True.

18  $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$  and  $A^k = \frac{1}{2} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 3^k \end{bmatrix} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$ . Multiply those last three matrices to get  $A^k = \frac{1}{2} \begin{bmatrix} 1 + 3^k & 1 - 3^k \\ 1 - 3^k & 1 + 3^k \end{bmatrix}$ .