Week 10

Section 6.1

1. Determine whether the following polynomials have rational root(s), real root(s), or a pair of complex roots. In each case, find the roots.

   (a) $x^3 - x^2 + x - 1$

   (b) $2x^3 + x^2 - x$

   (c) $x^3 - 6x^2 + 10x$

   (d) $2x^3 + x^2 - 4x + 1$

   (e) $x^3 - 5x^2 + 2x + 1$

   (f) $2x^3 + 7x^2 + 5x + 1$

2. Find the eigenvalue-eigenvector pair for the following 2×2 matrices

   (a) Reflection by $\pi/2$

   (b) Reflection by $3\pi/2$

   (c) Reflection by $\pi/6$

   (d) Rotation by $\pi/2$

   (e) Rotation by $3\pi/2$

   (f) Rotation by $\pi/6$

3. What are the eigenvalues and eigenvectors of the projection matrix? Describe it qualitatively.

4. Find the eigenvector-eigenvalue pair for the following matrices

   (a) $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 5 \\ 0 & 4 & 3 \end{bmatrix}$

   (b) $B = \begin{bmatrix} 7 & 0 & -3 \\ -9 & -2 & 3 \\ 18 & 0 & -8 \end{bmatrix}$

   (c) $C = \begin{bmatrix} 4 & 6 & 10 \\ 3 & 10 & 13 \\ -2 & -6 & -8 \end{bmatrix}$

   (d) $R = \begin{bmatrix} -6 & 3 \\ 4 & 5 \end{bmatrix}$

   (e) $S = \begin{bmatrix} -1 & 2 \\ 0 & -1 \end{bmatrix}$

   (f) $T = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$