

## Math 218D

### Quiz 7

1. Find the followings for the matrix

$$A = \begin{pmatrix} -1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 3 & -1 \end{pmatrix}$$

- a) Characteristic polynomial  $p(\lambda) = ?$
- b) Eigenvalues (one of the eigenvalues is  $\lambda_1 = -1$ ).
- c) Eigenvectors.

2. Let  $A$  be a matrix with orthonormal columns  $\{v_1, \dots, v_n\}$ , and  $P_V$  be the projection matrix associated with the subspace  $V = \text{Col}(A)$ . Determine if the following statements are **True** or **False**?

- a) \_\_\_\_\_ :  $P_V = AA^T = I$  .
- b) \_\_\_\_\_ :  $A^T A = I$ .
- c) \_\_\_\_\_ :  $P_V^T P_V = I$ .
- d) \_\_\_\_\_ : The null space of  $P_V$  equals to  $V$ .
- e) \_\_\_\_\_ :  $P_V P_{V^\perp} = 0$ .