Name: _____

1. (4 points)

(a) Find the characteristic polynomial of the matrix

$$A = \begin{pmatrix} 1 & -1 \\ 2 & 4 \end{pmatrix}.$$

(b) Determine the eigenvalues of $A$.

2. (3 points) Let
$$A = \begin{pmatrix} a & k \\ -1 & a \end{pmatrix}.$$
For which values of $k$ does the matrix $A$ have no (real) eigenvalues?

3. (4 points) True or false. Indicate whether the following statements are true or false.

(a) There exists a $3 \times 3$ matrix $A$ without any real eigenvalues.

(b) A square matrix $A$ is invertible if and only if $0$ is *not* an eigenvalue of $A$.