

Math 304, Section 5 — Quiz 16 – April 12

Name: \_\_\_\_\_

1. Complete the following definition of eigenvector and eigenvalue: we say that  $\beta$  is an eigenvalue of the matrix  $N$  and  $w$  an eigenvector associated to the eigenvalue  $\beta$  if the following conditions hold:

2. What are the eigenvalues of the matrix  $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$ ?

3. Show, using the definition of eigenvector, that the vector  $v = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$  is an eigenvector of  $A$ . What is the associated eigenvalue?

4. Show, using the definition of eigenvector, that the vector  $x = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$  is an eigenvector of  $A$ . What is the associated eigenvalue?

5. Complete the following definition of “change of basis matrix”. If  $E$  is the old basis, and  $B$  is the new basis, then the change of basis matrix  $P$  has \_\_\_\_\_ which express the vectors of the basis \_\_\_\_\_ in terms of the vectors of the basis \_\_\_\_\_.

6. Let  $E$  be the standard (ordered) basis of  $\mathbb{R}^2$  and let  $B = (v, x)$  be a new (ordered) basis using the vectors from problems 3 and 4. What is the change of basis matrix  $P$ ?

7. Let  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be the linear transformation whose matrix with respect to the standard basis of  $\mathbb{R}^2$  is  $A$  (as in problem 2), that is  ${}_E T_E = A$ . What is the matrix of  $T$  with respect to the new basis  $B$ ?