

## Assignment WW-Eigenspaces

1. (1 point)

Find the null space for  $A = \begin{bmatrix} 1 & 7 \\ 8 & 4 \end{bmatrix}$ .What is  $\text{null}(A)$ ?

- A.  $\text{span}\left\{\begin{bmatrix} -7 \\ 1 \end{bmatrix}\right\}$
- B.  $\text{span}\left\{\begin{bmatrix} -8 \\ 1 \end{bmatrix}\right\}$
- C.  $\left\{\begin{bmatrix} 0 \\ 0 \end{bmatrix}\right\}$
- D.  $\text{span}\left\{\begin{bmatrix} 1 \\ 8 \end{bmatrix}\right\}$
- E.  $\text{span}\left\{\begin{bmatrix} 1 \\ 7 \end{bmatrix}\right\}$
- F.  $\mathbb{R}^2$
- G.  $\text{span}\left\{\begin{bmatrix} 8 \\ 1 \end{bmatrix}\right\}$
- H. none of the above

**Solution:**

SOLUTION

A row reduces to the identity matrix.

Thus  $Ax = \mathbf{0}$  has only the trivial solution  $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$ ,and thus,  $\text{null}(A) = \left\{\begin{bmatrix} 0 \\ 0 \end{bmatrix}\right\}$ .*Correct Answers:*

- C

2. (1 point) Let

$$A = \begin{bmatrix} -2 & -2 & -4 & -6 \\ -3 & -3 & -6 & -9 \end{bmatrix}.$$

Find a basis for the null space of  $A$ .

$$\left\{ \begin{bmatrix} \_ \\ \_ \\ \_ \\ \_ \end{bmatrix}, \begin{bmatrix} \_ \\ \_ \\ \_ \\ \_ \end{bmatrix}, \begin{bmatrix} \_ \\ \_ \\ \_ \\ \_ \end{bmatrix} \right\}.$$

*Correct Answers:*

- $\left[ \begin{bmatrix} -1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 3 \\ 0 \\ -1 \end{bmatrix} \right]$

3. (1 point) The matrix

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

has one real eigenvalue. Find this eigenvalue and a basis of the eigenspace.

The eigenvalue is \_\_\_\_\_.

A basis for the eigenspace is  $\left\{ \begin{bmatrix} \_ \\ \_ \\ \_ \end{bmatrix}, \begin{bmatrix} \_ \\ \_ \\ \_ \end{bmatrix} \right\}$ .*Correct Answers:*

- -1
- $\left[ \begin{bmatrix} 0 \\ -2 \\ -1 \end{bmatrix}, \begin{bmatrix} -1 \\ -1 \\ -1 \end{bmatrix} \right]$

4. (1 point) The matrix

$$A = \begin{bmatrix} 0 & 10 & -20 \\ 0 & -5 & 10 \\ 0 & -5 & 10 \end{bmatrix}$$

has two real eigenvalues, one of multiplicity 1 and one of multiplicity 2. Find the eigenvalues and a basis for each eigenspace.

The eigenvalue  $\lambda_1$  is \_\_\_\_\_ and a basis for its associated eigenspace is  $\left\{ \begin{bmatrix} \_ \\ \_ \\ \_ \end{bmatrix} \right\}$ .The eigenvalue  $\lambda_2$  is \_\_\_\_\_ and a basis for its associated eigenspace is  $\left\{ \begin{bmatrix} \_ \\ \_ \\ \_ \end{bmatrix}, \begin{bmatrix} \_ \\ \_ \\ \_ \end{bmatrix} \right\}$ .*Correct Answers:*

- 5
- $\begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$
- 0
- $\left[ \begin{bmatrix} 2 \\ -3 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} -2 \\ -1 \\ -1 \end{bmatrix} \right]$

