Math 309 Spring, 2023
Krantz

# PRACTICE SECOND MIDTERM EXAM

**1.** Calculate the inverse of the matrix

$$\begin{bmatrix} 2 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 2 & 0 \end{bmatrix}.$$

**2.** Let

$$A = \begin{bmatrix} 1 & -3 & -4 \\ -4 & 6 & -2 \\ -3 & 7 & 6 \end{bmatrix}.$$

Define

$$\mathbf{b} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}.$$

Is $\mathbf{b}$ in the column space of $A$?

**3.** Find a basis for the null space of

$$\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 0 \\ 2 & 1 & 1 \end{bmatrix}.$$

**4.** Find a basis for the column space of

$$B = \begin{bmatrix} 0 & -3 & 4 \\ 1 & 1 & -1 \\ 8 & 0 & 0 \end{bmatrix}.$$

**5.** Calculate the determinant of

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 1 \\ 4 & 1 & 4 \end{bmatrix}.$$

**6.** Use Cramer's Rule to solve the system

$$\begin{aligned} 2x_1 - x_2 &= 6 \\ -3x_1 + 2x_2 &= 8 \end{aligned}$$

**7.** Let

$$A = \begin{bmatrix} 5 & 1 \\ 3 & 3 \end{bmatrix} \qquad \text{and} \qquad B = \begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}.$$

Verify that

$$\det(AB) = [\det A] \cdot [\det B].$$

**8.** Are the vectors

$$\mathbf{v}_1 = \begin{bmatrix} 5 \\ -3 \\ 9 \end{bmatrix} \quad , \quad \mathbf{v}_2 = \begin{bmatrix} -3 \\ 1 \\ -5 \end{bmatrix} \quad , \quad \mathbf{v}_3 = \begin{bmatrix} 1 \\ -3 \\ 5 \end{bmatrix}$$

linearly independent? Why or why not?