

## MATH 242: Practice Exam 1

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Show all appropriate work.

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- (a) Find two (non-colinear) unit vectors in  $\mathbb{R}^3$  perpendicular to  $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ .  
(b) Write the  $3 \times 3$  matrix  $E$  such that  $EA$  is the matrix obtained from  $A$  by subtracting row 1 from row 3, and leaving rows 1 and 2 unchanged.

2. Let

$$A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 4 \\ 3 & 0 & 1 \end{pmatrix}.$$

- Put  $A$  in upper triangular form
  - Factor  $A$  as  $A = LU$ .
  - What is the determinant of  $A$ ?
  - Solve the equation  $A\mathbf{x} = \begin{pmatrix} 0 \\ 6 \\ 7 \end{pmatrix}$ .
- (a) What values of  $h$  make the columns of  $B = \begin{pmatrix} 1 & 4 & 3 \\ 3 & 5 & 7 \\ 8 & 18 & h \end{pmatrix}$  dependent. You must justify your answer to receive credit.  
(b) What is the inverse of  $A = \begin{pmatrix} 1 & 0 & 2 \\ 4 & 2 & 0 \\ 0 & 6 & 2 \end{pmatrix}$ ?
4. Which of the following matrices are invertible? Justify your answer.

$$A = \begin{pmatrix} 4 & 7 \\ 3 & 5 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 0 & 0 \\ 8 & -3 & 0 \\ 0 & 6 & 7 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 2 & 0 & 4 \\ 2 & 4 & 0 & 8 \\ -1 & 7 & 6 & 0 \\ 2.1 & 0 & 4 & 4 \end{pmatrix} \quad D = \begin{pmatrix} 2 & 4 & 1 & 3 & 8 \\ 7 & 1 & 0 & 6 & 0 \\ 0 & 5 & 2 & 1 & 1 \end{pmatrix}$$