1. Assume $A$ and $B$ are $3 \times 3$ matrices and $c$ is any real number.
   a. If $A$ is symmetric, is $c \cdot A$ also symmetric? Explain.
   b. If $A$ is diagonal and $B$ is upper triangular, must $A + B$ be upper triangular? Must $A + B$ be diagonal? Explain.
   c. Let $Z$ be a matrix filled with zeros for every entry. Is $Z$ lower triangular? Explain.

2. Consider the matrix $A = \begin{bmatrix} 0 & 1 & 0 & -1 \\ 3 & 5 & -1 & 4 \\ -2 & 4 & 0 & -3 \\ 0 & -1 & 0 & 1 \end{bmatrix}$.
   a. Compute $M_{43}$.
   b. Compute $C_{43}$.
   c. Compute $|A|$.

3. Assume $A$ is a $5 \times 5$ matrix such that $|A| = 4$. Also assume $E$ is a $5 \times 5$ elementary matrix.
   a. If $E$ corresponds to $3 \cdot r_4 \leftrightarrow r_4$, find $|EA|$.
   b. If $E$ corresponds to $r_2 \leftrightarrow r_5$, find $|EA|$.
   c. If $E$ corresponds to $r_i - 10r_3 \leftrightarrow r_i$, find $|EA|$.

4. Assume $A$ is an $n \times n$ matrix and $c$ is any real number. Then, $|c \cdot A| = c^n \cdot |A|$. Explain.

5. Assume $A$ and $B$ are invertible matrices of the same size.
   a. Show that $|AB| = |A| \cdot |B|$. (Hint: elementary matrices.)
   b. Show that $|A^T A| = |A|^2$. 

Quiz Fri Jun 5