Math 241 Homework

Mary Radcliffe

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Complete the following problems. Fully justify each response.

1. Calculate each of the following determinants:
   (a) $\det\left(\begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}\right)$
   (b) $\det\left(\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}\right)$
2. Prove that the determinant of an upper triangular matrix is equal to the product of the diagonal entries of the matrix.
3. Complete problems 12.14.2, 12.14.3, 12.14.9 on pages 483-485 in Coding the Matrix.
4. Suppose that λ is an eigenvalue of the invertible matrix A having a corresponding eigenvector $\mathbf{v}$. Prove that $\frac{1}{\lambda}$ is an eigenvalue of A^{-1}. What is a corresponding eigenvector?
5. Use the previous problem to prove that a square matrix A is invertible if and only if 0 is not an eigenvalue of A.
6. Complete the problem set found at `autolab.andrew.cmu.edu`. The submission for this is directly on autolab, no need to hand it in on paper.