Matrix Algebra Practice Problems

# Part I: Computations

1. Which of the following matrices are idempotent?
2. Find the determinant of the following matrices:
3. Find the inverse of the following matrices:
4. Consider the elementary matrices:

which multiplies row i by

which switches rows i and j

which adds times row j to row i

What are the inverses of each of these matrices? Write them in terms of the symbols above, not using an array of numbers.

1. Find the inverse of the following matrix. Write the matrix and its inverse as products of elementary matrices.
2. Compute the inner products of the following vectors. Which of the pairs are orthogonal?
3. ,
4. ,

# Part II: Proofs

1. Prove that for square matrices , if is a right inverse of (i.e. ) and C is a left inverse of (i.e. ), then . Moreover, the inverse is unique.
2. Prove that the product of 2 lower triangular matrices is lower triangular.