

## Math 307: Problems for section 4.7

1. For  $n \times n$  matrices  $A$  and  $B$  do  $AB$  and  $BA$  always have the same eigenvalues? Use MATLAB/Octave to guess an answer and then verify your guess in the special case that one of the matrices, say  $A$ , is invertible. Do they have the same singular values? What happens when  $A$  is  $n \times m$  and  $B$  is  $m \times n$  matrices with  $n \neq m$ ? Guess the answer using MATLAB/Octave.
2. Suppose the matrix  $A$  given by

```
> A
A =

    0.95    0.70    0.10
    0.57    0.52    0.25
    0.28    0.67    0.76
    0.63    0.61    0.30
```

contains measured values that are accurate to within 0.1. Is it possible that the "real" matrix  $AA$  (i.e., without errors) has a non trivial null space? If so, what is a good approximation for this matrix and for a basis of its null space? Verify that the vector(s) you have found are in the null space of the matrix  $AA$  you have found.