

18.06 (Spring 14) Problem Set 3

This problem set is due Thursday, Feb 27, 2014 by 4pm in E17-131. The problems are out of the 4th edition of the textbook. This homework has 8 questions worth 80 points in total. Please WRITE NEATLY. You may discuss with others (and your TA), but you must turn in your own writing.

1. Explain why every vector in the column space of \mathbf{AB} is also in the column space of \mathbf{A} . (This will tell us an important fact: $\text{rank}(\mathbf{AB}) \leq \text{rank}(\mathbf{A})$.)
2. Explain why every vector in the nullspace of \mathbf{B} is also in the nullspace of \mathbf{AB} . Is this also true for every vector in the nullspace of \mathbf{A} ? If not, provide an example.
3. Suppose you have applied elimination to \mathbf{A} and reached $\mathbf{R} = \text{rref}(\mathbf{A})$. How would you be able to describe vectors (from looking at \mathbf{R}) that span the column space of \mathbf{A} ?
4. Suppose columns 2 and 4 of a 5 by 5 matrix \mathbf{A} are the same. Then _____ is a free variable. Find the special solution that goes with this free variable.
5. From looking at $\text{rref}(\mathbf{A})$, how can you read off all special solutions to $\mathbf{Ax} = \mathbf{0}$?
6. If \mathbf{A} is 3 by 4 and \mathbf{B} is 4 by 3, explain why \mathbf{BA} is not the identity matrix.
7. Problem 1, page 163 (section 3.4).
8. Problem 46, page 183 (section 3.5).
9. (Not to turn in) PLEASE practice finding $\mathbf{R} = \text{rref}(\mathbf{A})$ and also $\mathbf{N}(\mathbf{A})$ —choose a 3 by 5 matrix \mathbf{A} with $\text{rank } 2$.
10. MATLAB problems (20 pts): please go to lms.mitx.mit.edu to complete the problems.