

## 18.06 Problem Set 3

Due at 4pm on Wednesday, September 28 in 2-106

Please PRINT your name and recitation information on your homework

1. Section 2.7, Problem 24
2. Section 3.1, Problem 4
3. Section 3.1, Problem 19
4. Section 3.1, Problem 27
5. Section 3.2, Problem 23
6. Section 3.2, Problem 25
7. Section 3.3, Problem 3
8. Section 3.3, Problem 6
9. Section 3.3, Problem 8
10. Section 3.4, Problem 5
11. Section 3.4, Problem 32
12. Section 3.4, Problem 33
13. Section 3.4, Problem 34
14. (a) Suppose  $A$  is an  $m$  by  $n$  matrix with  $m < n$ . A *right inverse* of  $A$  is a matrix  $B$  such that  $AB = I$ . What are the dimensions of  $B$  and  $I$  in this case?  
(b) One can find a matrix  $B$  such that  $AB = I$  by using MATLAB operation  $A \setminus I$ . In MATLAB, type  $A = [-5 \ 3 \ 2; \ 4 \ -2 \ 0]$  to create the matrix  $A = \begin{bmatrix} -5 & 3 & 2 \\ 4 & -2 & 0 \end{bmatrix}$  and  $I = \text{eye}(2)$  to define  $I$  as the 2 by 2 identity matrix. Then input the command  $A \setminus I$ . MATLAB will then solve the equation  $AB = I$  for  $B$ . What output do you get?  
(c) Now try to find a right inverse of  $A$  in the “usual” way by row-reducing the augmented matrix  $[A \ I]$ . You can do this in MATLAB by entering the command  $\text{rref}([A \ I])$ . What is the result? Use the resulting reduced matrix to construct a matrix  $B$  satisfying  $AB = I$  different from the one obtained in part (b).  
(d) Explain why  $A$  has no left inverse. In other words, why isn't there a matrix  $C$  such that  $CA = I$ ? (What would the dimensions of  $C$  and  $I$  have to be in this case?)