Department of Applied Physics and Applied Mathematics
Columbia University

APMA S3101D: Applied Math I - Introduction to Linear Algebra

Summer 2003

Problem Set 1

Note: This is for those who use the SECOND version of the textbook. Those who have the third version of the book please go to ps1-v3.ps

(Due June 5, 2003)

1. Problem Set 1.1: 29
2. Problem Set 1.2: 1, 2, 18
3. Problem Set 2.1: 6, 10, 13, 28
4. Problem Set 2.2: 1, 2, 5, 11[1]
5. Problem Set 2.3: 2, 23

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[1] Reduce this system to upper triangular form by two row operations:

$$2x + 3y + z = 8 \tag{1}$$

$$4x + 7y + 5z = 20 \tag{2}$$

$$-2y + 2z = 0 \tag{3}$$

Circle the pivots. Solve by back substitution for z, y, x.

6. Problem Set 2.4: 1[2], 21[3]

7. Problem Set 2.5: 4[4] ,12, 24, 28, 29

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[2] A is 3 by 5, B is 5 by 3, C is 5 by 1, and D is 3 by 1. *All entries are* 1. Which of these matrix operations are allowed, and what are the results?

BA AB ABD DBA A(B+C)

[3] Compute A^2, A^3, A^4 and also Av, A^2v, A^3v, A^4v for

$$\mathbf{A} = \begin{pmatrix} 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix} \text{ and } \mathbf{v} = \begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix}$$

[4] Show that $\begin{pmatrix} 1 & 2 \\ 3 & 6 \end{pmatrix}$ has no inverse by trying to solve for the column (x,y):

$$\begin{pmatrix} 1 & 2 \\ 3 & 6 \end{pmatrix}\begin{pmatrix} x & t \\ y & z \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \text{ must include } \begin{pmatrix} 1 & 2 \\ 3 & 6 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$