

## Math 2270-3 Maple Project I

### Part A: some matrix algebra questions

(These questions are modified from problems on page 27 of the text *Multivariable Mathematics with Maple*, by J.A. Carlson and J.M Johnson.) You are to create a document in which you answer the following questions, via a mixture of Maple computations and textual insertions. You are to print out a copy of this document to hand in. Don't forget to put your name on it!

Define

$$A := \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

$$B := \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$$

- 1a) Compute  $AB$  and  $BA$ . Are they the same?
  - 1b) Compute  $A+B$  and  $B+A$ . Are they the same?
  - 1c) Define  $C$  to be  $A+B$ . Compute  $C^2$  and compare it to  $A^2 + 2AB + B^2$ . Are they the same? Can you think of a small change you could make in the expression " $A^2 + 2AB + B^2$ " in order to make it equal to  $C^2$ ? Justify your answers!
  - 1d) Define  $v=(1,2,3)$  to be a vector. Compute  $Av$ . What does Maple give you when you try  $vA$ ?
  - 1e) Solve  $Bx=v$  for  $x$ , where  $v$  is the vector in (1d). Get your solution all three ways that were indicated above: by row-reducing the augmented matrix, by using the command "`linsolve`", and by using the inverse matrix to  $B$ .
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- 2a) Solve  $Ax=v$  for  $x$ , where  $A$  and  $v$  are as indicated above. Verify, with Maple, that your solution  $x$  actually solves the equation  $Ax=v$ .
  - 2b) Repeat your work above in order to solve  $Ax=w$ , where  $w=(-1,4,1)$ . Explain your answer.

### Part B: reflections

Work through the worksheet "2270vec.mws." This worksheet goes through the process of adding vectors in 2D and executes code for projecting vectors in 2D. Note how there is code to visualize the projection. Try inputting some different vectors in to see how additions and projections work. Your task for this part is to write a Maple Worksheet that takes a vector in 2D and reflects it about a line in the coordinate plane and then visualizes this projection. Feel free to use any vector to test and debug your program. Make sure you put the appropriate text comments into your file so that I can understand it.