

Due Date: Fri, 12 Oct 2001.

Name: _____

Math 214 – Linear Systems
Fall Term 2001

Lab 2

Directions: This is a brief lab on determinants. You may simply fill in the information requested, giving short explanations, especially when you are asked to make a conjecture (educated guess). You may work together, but what you present here must reflect **your understanding**.

DETERMINANTS

MatLab can find the determinant of A very quickly with the command: `det(A)`.

1. Without the computer, find the following determinants, giving a brief comment on how you got your answer (they should be quite easy with a little thought). Then use MatLab's `det(A)` command to verify your answers:

(a) $I = \text{eye}(3) = \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}$. $\det(I) =$

(b) $B = \begin{bmatrix} 4 & 4 & 4 \\ 7 & 7 & 7 \\ 2 & 3 & 4 \end{bmatrix}$. $\det(B) =$

(c) $C = \begin{bmatrix} 3 & 0 & 0 \\ -1 & 2 & 0 \\ -7 & \pi & 1 \end{bmatrix}$. $\det(C) =$

(Note: You can just type `pi` in MatLab.)

2. Find the determinant of A below using MatLab. Then use this value to make conjectures (educated guesses) about the remaining determinants. Give a brief comment on how you made your conjecture. Finally, check your answers by using MatLab.

$$\det(A) = \begin{vmatrix} 1 & -2 & 1 \\ -2 & 6 & -2 \\ -3 & 6 & -2 \end{vmatrix} =$$

(a) Conjecture (w/ brief reasoning): $\det(2*A) = |2A| =$

Check with MatLab.

(b) Conjecture (w/ brief reasoning): $\det(-A) = |-A| =$

Check with MatLab. Is $\det(-M)$ always equal to $-\det(M)$ for any matrix M ? How do you make this result consistent with part (a)?

(c) Conjecture (w/ brief reasoning): $\det(A^T) = |A^T| =$

Check with MatLab.

(d) Conjecture (w/ brief reasoning): $\det(\text{inv}(A)) = |A^{-1}| =$

Check with MatLab.

3. The following problem shows that the calculation of the determinant is sometimes sensitive to small changes in the elements of the matrix. Let

$$A = \begin{bmatrix} -73 & 78 & 24 \\ 92 & 66 & 25 \\ -80 & 37 & 10 \end{bmatrix}$$

then compute the following. (Note: Recall the quick way to change just one element in a matrix is to type in the whole matrix and then type something like $A(3,3) = 10.01$.)

(a) $\det(A)$

(b) $\det(A)$ where $a_{33} = 10.01$

(c) $\det(A)$ where $a_{21} = 92.01$ (Put a_{33} back to 10)

(d) $\det(A)$ where $a_{12} = 78.01$ (Put a_{21} back to 92)

Question for Reflection. Reflect on the following question and type a short but detailed response. The response should be well-reasoned and well-written (i.e., complete sentences, paragraphs, thoughts). You may write your response on the back of this sheet, or attach it to this lab.

- Consider section 3. Can you explain this “sensitivity” with a geometric interpretation of the determinant?