E2.3.3 Questions 5-6

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Exam 2 due Dec 3, 2023 04:42 IST Completed

E2.3.3 Questions 5-6

Question 5

10.0/10.0 points (graded)

Compute

(a) $\begin{pmatrix} 1 & -2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix} =$

1 ✔	0 ✔	0 ✔	0 ✔
Answer: 1	Answer: 0	Answer: 0	Answer: 0
0 ✔	1 ✔	0 ✔	0 ✔
Answer: 0	Answer: 1	Answer: 0	Answer: 0
0 ✔	0 ✔	1 ✔	0 ✔
Answer: 0	Answer: 0	Answer: 1	Answer: 0
0 ✔	0 ✔	0 ✔	1 ✔
Answer: 0	Answer: 0	Answer: 0	Answer: 1

(b) $\begin{pmatrix} 1 & 2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix} =$

2 ✔	0 ✔	0 ✔	1 ✔
Answer: 2	Answer: 0	Answer: 0	Answer: 1
1 ✔	0 ✔	0 ✔	0 ✔
Answer: 1	Answer: 0	Answer: 0	Answer: 0
-3 ✔	0 ✔	1 ✔	0 ✔
Answer: -3	Answer: 0	Answer: 1	Answer: 0
1 ✔	1 ✔	0 ✔	0 ✔
Answer: 1	Answer: 1	Answer: 0	Answer: 0

(c) $\begin{pmatrix} 1 & u_{1,0} & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & l_{1,2} & 1 & 0 \\ 0 & l_{1,3} & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & -1 \\ -1 & 2 \\ -1 & 2 \\ 1 & -2 \end{pmatrix} = \begin{pmatrix} 0 & 3 \\ -1 & 2 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$

Calculator

$u_{1,0} =$

2 ✔ Answer: 2

$l_{1,2} =$

-1 ✔ Answer: -1

$l_{1,3} =$

1 ✔ Answer: 1

(a) (3 points)

$$\begin{pmatrix} 1 & -2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix} = I$$

Answer: These are Gauss transforms that can be easily recognized to be inverses of each other.

(b) (3 points)

$$\left(\begin{array}{cccc} 1 & 2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{array}\right) \left(\begin{array}{c|c|c|c} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{array}\right) = \left(\begin{array}{c|c|c|c} 2 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ -3 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \end{array}\right)$$

Answer: Multiplication from the right with a permutation matrix permutes the columns of a matrix.

(c) (4 points)

Fill in the boxes:

$$\begin{pmatrix} 1 & \boxed{2} & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & \boxed{-1} & 1 & 0 \\ 0 & \boxed{1} & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & -1 \\ -1 & 2 \\ -1 & 2 \\ 1 & -2 \end{pmatrix} = \begin{pmatrix} 0 & 3 \\ -1 & 2 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

Submit

Answers are displayed within the problem

Question 6

15.0/15.0 points (graded)

(a) Invert $A = \begin{pmatrix} 2 & -1 & 0 \\ -2 & 0 & 6 \\ 6 & -2 & -3 \end{pmatrix}$.

$A^{-1} =$

-2 ✔ Answer: -2 | 1/2 ✔ Answer: 1/2 | 1 ✔ Answer: 1

-5 ✔ | 1 ✔ | 2 ✔

Calculator

Answer: -5

-2/3 ✔

Answer: -2/3

Answer: 1

1/3 ✔

Answer: 1/3

Answer: 2

1/3 ✔

Answer: 1/3

(b) Does $A = \begin{pmatrix} -4 & 2 \\ 2 & -3 \end{pmatrix}$ have an inverse?

YES ✔ Answer: YES

Answer:

$$\left(\begin{array}{ccc} 1 & 0 & 0 \\ 1 & 1 & 0 \\ -3 & 0 & 1 \end{array}\right)\left(\begin{array}{ccc|ccc} 2 & -1 & 0 & 1 & 0 & 0 \\ -2 & 0 & 6 & 0 & 1 & 0 \\ 6 & -2 & -3 & 0 & 0 & 1 \end{array}\right) = \left(\begin{array}{ccc|ccc} 2 & -1 & 0 & 1 & 0 & 0 \\ 0 & -1 & 6 & 1 & 1 & 0 \\ 0 & 1 & -3 & -3 & 0 & 1 \end{array}\right)$$

$$\left(\begin{array}{ccc} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{array}\right)\left(\begin{array}{ccc|ccc} 2 & -1 & 0 & 1 & 0 & 0 \\ 0 & -1 & 6 & 1 & 1 & 0 \\ 0 & 1 & -3 & -3 & 0 & 1 \end{array}\right) = \left(\begin{array}{ccc|ccc} 2 & 0 & -6 & 0 & -1 & 0 \\ 0 & -1 & 6 & 1 & 1 & 0 \\ 0 & 0 & 3 & -2 & 1 & 1 \end{array}\right)$$

$$\left(\begin{array}{ccc} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{array}\right)\left(\begin{array}{ccc|ccc} 2 & 0 & -6 & 0 & -1 & 0 \\ 0 & -1 & 6 & 1 & 1 & 0 \\ 0 & 0 & 3 & -2 & 1 & 1 \end{array}\right) = \left(\begin{array}{ccc|ccc} 2 & 0 & 0 & -4 & 1 & 2 \\ 0 & -1 & 0 & 5 & -1 & -2 \\ 0 & 0 & 3 & -2 & 1 & 1 \end{array}\right)$$

$$\left(\begin{array}{ccc} 1/2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1/3 \end{array}\right)\left(\begin{array}{ccc|ccc} 2 & 0 & 0 & -4 & 1 & 2 \\ 0 & -1 & 0 & 5 & -1 & -2 \\ 0 & 0 & 3 & -2 & 1 & 1 \end{array}\right) = \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & -2 & 1/2 & 1 \\ 0 & 1 & 0 & -5 & 1 & 2 \\ 0 & 0 & 1 & -2/3 & 1/3 & 1/3 \end{array}\right)$$

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Calculator