MATH 129A (8) **SPRING 2017** **QUIZ 6**

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5 pts

1. 2 pts. Find the inverse of the following matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 7 \end{bmatrix}$.

$\det A = (1 \cdot 7) - (2 \cdot 4)$

$\boxed{\det A = 7 - 8 = -1}$

$A^{-1} = \frac{1}{\det A} \begin{bmatrix} 7 & -2 \\ -4 & 1 \end{bmatrix}$

$A^{-1} = (-1) \begin{bmatrix} 7 & -2 \\ -4 & 1 \end{bmatrix}$

$\boxed{A^{-1} = \begin{bmatrix} -7 & 2 \\ 4 & -1 \end{bmatrix}}$

Using augmented matrix on the back

Check work

$\begin{bmatrix} 1 & 2 \\ 4 & 7 \end{bmatrix}\begin{bmatrix} -7 & 2 \\ 4 & -1 \end{bmatrix} = \begin{bmatrix} -7+8 & 2-2 \\ -28+28 & 8-7 \end{bmatrix}$

$A A^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\begin{bmatrix} -7 & 2 \\ 4 & -1 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} (-7)(1)+(2)(4) & -14+14 \\ 4(1)-(1)(4) & 8-7 \end{bmatrix}$

$A^{-1} A = \begin{bmatrix} -7+8 & 0 \\ 4-4 & 8-7 \end{bmatrix}$

$A^{-1} A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

2. 3 pts. If A, B, and C are $n\times n$ invertible matrices, does the equation $C^{-1}(A+X)B^{-1} = I_n$ have a solution, X? If so, find it.

Find X

$C^{-1}(A+X)B^{-1} = I_n$

Multiply both sides by C - property matrix multiplication

$CC^{-1}(A+X)B^{-1} = CI_n$

By definition of inverse and identity matrix

$(A+X)B^{-1} = C$

Multiply by B on both sides

$(A+X)B^{-1}B = CB$

By definition of inverse matrix

$A + X = CB$

Subtract A from both sides by

$\boxed{X = CB - A}$

Has a solution

Verification

$C^{-1}(A+X)B^{-1} = I_n$

$C^{-1}(A+CB-A)B^{-1} = I_n$ substitute for matrix X

$C^{-1}(CB)B^{-1} = I_n$ property matrix subtraction

$(C^{-1}C)(BB^{-1}) = I_n$ Associative property of matrix multiplication

$I_n I_n = I_n$ Definition of inverse

$\boxed{I_n = I_n}$ property of identity matrix.