CS 132 Assignment4

Gordon Ng

TOTAL POINTS

82 / 87

QUESTION 1

1 3 / 3

✓ **- 0 pts** Correct

- 1 pts E21 is Incorrect or was not computed

- 1 pts E31 is Incorrect or was not computed

- 1 pts E32 is Incorrect or was not computed

- 1 pts L is Incorrect or was not computed

QUESTION 2

2 6 / 6

✓ **- 0 pts** Correct

- 2 pts Part a) is incorrect or incomplete

- 2 pts Part b) is incorrect or incomplete

- 2 pts Part c) is incorrect or incomplete

QUESTION 3

3 1 / 3

- 0 pts Correct

- 1.5 pts Missing or wrong L^−1

- 1.5 pts Missing or wrong U^−1

- 1.5 pts Wrong answer using A^−2 = U^−2 L^−2 or A^−1 = L^−1 U^−1

- 1.5 pts Correct answer without explanation

✓ **- 2 pts Wrong answer with partial correct explanation**

- 3 pts Wrong or missing answer

QUESTION 4

4 10 / 10

✓ **- 0 pts** Correct

- 0.5 pts Slightly incorrect U^-1

- 0.5 pts Slightly incorrect L^-1

- 1 pts Incorrect L^-1

- 1 pts Incorrect U^-1

- 1 pts Slightly Incorrect L

- 1 pts Slightly Incorrect U

- 2 pts Incorrect L

- 2 pts Incorrect U

- 1 pts Incorrect final result but correct work

- 4 pts Incorrect final result and work

- 10 pts Missing/Incorrect

QUESTION 5

5 10 / 10

✓ **- 0 pts** Correct

- 3 pts Incorrect partition matrix

- 2 pts Slightly incorrect inverse of partitioned matrix

- 4 pts Incorrect inverse of partitioned matrix

- 1 pts Slightly incorrect inverse of each block or component

- 2 pts Incorrect inverse of each block or component

- 1 pts Incorrect final result

- 10 pts Missing/Incorrect

QUESTION 6

6 7 / 10

+ 10 pts Correct

✓ **+ 4 pts partitions Xk , X(Tk) in the correct way**

✓ **+ 3 pts correctly multiply two block matrix**

+ 3 pts correctly calculate the difference.

+ 0 pts Wrong or missing answer

QUESTION 7

15 pts

7.1 5 / 5

✓ **- 0 pts** Correct

- 5 pts No answer

7.2 5 / 5

✓ **- 0 pts** Correct

- **5 pts** No answer

7.3 **5 / 5**

✓ **- 0 pts** Correct

- **1.66 pts** Partly Correct
- **3.32 pts** Partly Correct
- **5 pts** Incorrect
- **1 pts** Pages Not Selected or Not Selected Correctly
- **5 pts** Missing

QUESTION 8

8 **10 / 10**

✓ **- 0 pts** Correct

- **3 pts** failure to show A is invertible
- **3 pts** failure to show A–1 is lower triangular.
- **4 pts** failure to show why the operations that reduce A to I change I into a lower triangular matrix.
- **10 pts** Wrong or missing answer

QUESTION 9

10 pts

9.1 **5 / 5**

✓ **- 0 pts** Correct

- **5 pts** Incorrect
- **1 pts** Pages Not Selected Or Pages Not Selected Correctly
- **5 pts** Missing

9.2 **5 / 5**

✓ **- 0 pts** Correct

- **5 pts** Incorrect
- **1 pts** Pages not selected or not selected correctly
- **5 pts** Missing

QUESTION 10

10 pts

10.1 **5 / 5**

✓ **- 0 pts** Correct

- **5 pts** No answer

10.2 **5 / 5**

✓ **- 0 pts** Correct

- **5 pts** No answer

gradescope

upper $\begin{bmatrix} x & x & x \\ & x & x \\ & & x \end{bmatrix}$ lower $\begin{bmatrix} x & & \\ x & x & \\ x & x & x \end{bmatrix}$

1. $E_{32} E_{31} E_{21} A = \overset{\text{upper}}{U}$ $A = LU$

$2 \begin{bmatrix} 1 & 1 & 1 \\ 2 & 4 & 5 \\ 0 & 4 & 0 \end{bmatrix} - \cancel{\begin{bmatrix} 1 & 1 & 1 \\ 0 & 4 & 5 \end{bmatrix}} - 2 \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \\ 0 & 0 & -6 \end{bmatrix}$

$E_{21} = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ $E_{31} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ $E_{32} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix}$

$E_{21}^{-1} E_{31}^{-1} E_{32}^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 2 & 0 \end{pmatrix} = L$

$U = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \\ 0 & 0 & -6 \end{pmatrix}$ $A = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 4 & 5 \\ 0 & 4 & 0 \end{pmatrix}$

2a) The Gaussian method leaves zeros under pivots, so the identity. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

b) $EL = I$, if you do elimination, you follow the formula, $E = L^{-1}$

c) $LU = A$ $E(LU = A)$ $ELU = EA$ $I(EL = I)$ $IU = EA$

$U = EA$ So, it would be U.

?? 3. ~~Avx~~ $A^{-1}x = v \equiv Av = x$ $L(Ux) = b$ $LUx = b$

$A^{-1}(x + A^{-1}y)$ $Ly = b$ $Ux = y$

$y = L^{-1}b$ $x = U^{-1}y$

$A \begin{pmatrix} \square & * & * \\ & \square & * \\ & & \square \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$

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

$A^{-1} = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 0 \\ 1 & -1 & 1 \end{bmatrix}$ $A^{-2} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 1 & 1 \\ 3 & -2 & 0 \end{bmatrix}$ $x = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ $y = \begin{bmatrix} - \\ 1 \\ \ldots \end{bmatrix}$

1 3 / 3

- ✓ **- 0 pts** Correct
- **- 1 pts** E21 is Incorrect or was not computed
- **- 1 pts** E31 is Incorrect or was not computed
- **- 1 pts** E32 is Incorrect or was not computed
- **- 1 pts** L is Incorrect or was not computed

gradescope

upper
$$\begin{bmatrix} x & x & x \\ & x & x \\ & & x \end{bmatrix}$$
lower
$$\begin{bmatrix} x & & \\ x & x & \\ x & x & x \end{bmatrix}$$

1. $E_{32} E_{31} E_{21} A = U$ (upper) $\qquad A = LU$

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 4 & 5 \\ 0 & 4 & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \\ 0 & 0 & -6 \end{bmatrix}$$

$$E_{21} = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad E_{31} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad E_{32} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix}$$

$$E_{21}^{-1} E_{31}^{-1} E_{32}^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 2 & 0 \end{pmatrix} = L$$

$$U = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \\ 0 & 0 & -6 \end{pmatrix} \quad A = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 4 & 5 \\ 0 & 4 & 0 \end{pmatrix}$$

2a) The Gaussian method leaves zeros under pivots, so the identity. $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

b) $EL = I$, if you do elimination, you follow the formula, $E = L^{-1}$

c) $LU = A \qquad E(LU = A) \qquad ELU = EA \qquad E(EL = I) \qquad IU = EA$

$U = EA$ So, it would be U.

?? ~~3.~~ $A^{-1}x = v \equiv Av = x \qquad L(Ux) = b \qquad LUx = b$

$A^{-1}(x + A^{-1}y) \qquad Ly = b \qquad Ux = y$

$y = L^{-1}b \qquad x = U^{-1}y$

$$A \begin{pmatrix} \square & * & * \\ & \square & * \\ & & \square \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$$

$$L = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \quad U = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \quad L^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & -1 & 1 \end{bmatrix} \quad U^{-1} = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 0 \\ 1 & -1 & 1 \end{bmatrix} \quad A^{-2} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 1 & 1 \\ 3 & -2 & 0 \end{bmatrix} \quad x = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \quad y = \begin{bmatrix} - \\ 1 \\ \end{bmatrix}$$

2 6 / 6

- ✓ **- 0 pts** Correct
- **- 2 pts** Part a) is incorrect or incomplete
- **- 2 pts** Part b) is incorrect or incomplete
- **- 2 pts** Part c) is incorrect or incomplete

gradescope

3) $L = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ $U = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ $x = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ $y = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$ $A = LU$

$A^{-1}y \Leftrightarrow Az = y$ $A^{-1}x + A^{-2}y$ $A^{-1}(\cancel{A}x + A^{-1}y)$

$Ax = b$

$LUx = b$

$Lv = y$

$Uz = v$

$$\begin{bmatrix} \square & * & * \\ 0 & \square & * \\ 0 & 0 & \square \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix} \quad v = \begin{bmatrix} -1 \\ 2 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \\ -1 \end{bmatrix} \quad u = \begin{bmatrix} 0 \\ 3 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{21} \\ u_{22} \\ u_{23} \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix} \quad u_2 = \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} v_{21} \\ v_{22} \\ v_{23} \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix} \quad v_2 = \begin{bmatrix} -3 \\ 4 \\ 2 \end{bmatrix}$$

$$A^{-1}x + A^{-2}y = \begin{bmatrix} -3 \\ 4 \\ -2 \end{bmatrix}$$

3 1 / 3

- **- 0 pts** Correct
- **- 1.5 pts** Missing or wrong L^−1
- **- 1.5 pts** Missing or wrong U^−1
- **- 1.5 pts** Wrong answer using A^−2 = U^−2 L^−2 or A^−1 = L^−1 U^−1
- **- 1.5 pts** Correct answer without explanation
- ✓ **- 2 pts Wrong answer with partial correct explanation**
- **- 3 pts** Wrong or missing answer

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4. In a set of all matrixes (addition + multiplication),

a) ~~ido~~ invertible matrixes

No $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} + B = \begin{pmatrix} 8 & 6 \\ 12 & 7 \end{pmatrix}$ $A+B = \begin{pmatrix} 9 & 6 \\ 12 & 8 \end{pmatrix}$ which is not invertible

No. b) $\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} + \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, $\begin{pmatrix} 5 & 0 \\ 0 & 0 \end{pmatrix} + \begin{pmatrix} 0 & 7 \\ 0 & 0 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 0 & 0 \end{pmatrix}$ is not singhlar

Yes c) $A = \begin{bmatrix} 3 & -2 & 4 \\ -2 & 6 & 2 \\ 4 & 2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 & 5 \\ 0 & 1 & 0 \\ 5 & 0 & 1 \end{bmatrix}$ The addition of this would still be symmetric (or multi) $A = A^T$ $(A+B)^T$ is $A+B$ ...

5) $\frac{1}{3}R_1 + R_2$

$U = \begin{bmatrix} 3 & 5 & 0 & 0 & 0 \\ 1 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 7 & 8 \\ 0 & 0 & 0 & 5 & 6 \end{bmatrix}$ $-5/7 R_4 + R_5$

$L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1/3 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

$E_1^{-1} E^{-2} (E_1 (E_2) A)^{-1} = (U (E^{-1} E^{-2}))^{-1}$

$A = U \cdot L$

$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 1/3 & -3 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 \\ 0 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 0 & 1/7 & -4 \\ 0 & 0 & 0 & 0 & 7/2 \end{bmatrix}$

$$A^{-1} = \begin{bmatrix} 1/3 & -3 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 \\ 0 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 0 & 1/7 & -4 \\ 0 & 0 & 0 & 0 & 7/2 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -1/3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -5/7 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -5 & 0 & 0 & 0 \\ -1 & 3 & 0 & 0 & 0 \\ 0 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 0 & 3 & -4 \\ 0 & 0 & 0 & -5/2 & 7/2 \end{bmatrix}$$

4 10 / 10

- ✓ **- 0 pts** Correct
- **- 0.5 pts** Slightly incorrect U^-1
- **- 0.5 pts** Slightly incorrect L^-1
- **- 1 pts** Incorrect L^-1
- **- 1 pts** Incorrect U^-1
- **- 1 pts** Slightly Incorrect L
- **- 1 pts** Slightly Incorrect U
- **- 2 pts** Incorrect L
- **- 2 pts** Incorrect U
- **- 1 pts** Incorrect final result but correct work
- **- 4 pts** Incorrect final result and work
- **- 10 pts** Missing/Incorrect

$$6.\quad \left[\begin{array}{ccc|cc} 3 & 5 & 0 & 0 & 0 \\ 1 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ \hline 0 & 0 & 0 & 7 & 8 \\ 0 & 0 & 0 & 5 & 6 \end{array}\right] \quad \begin{matrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{matrix} \quad \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_{11} B_{11} + \cancel{A_{12} B_{21}}^{\,0} = I$$

$$A_{11} B_{12} + \cancel{A_{12}}^{\,0} B_{22} = 0$$

$$0 \quad \cancel{A_{21} B_{11}} + A_{22} B_{21} = 0$$

$$0 \quad \cancel{A_{21} B_{12}} + A_{22} B_{22} = I$$

$$\cancel{A_{11}^{-1} A_{11}} B_{11} = A_{11}^{-1} I \qquad B_{11} = A_{11}^{-1}$$

$$B_{22} = A_{22}^{-1}$$

$$A = \begin{bmatrix} 3 & 5 & 0 \\ 1 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad \mathrm{inv}(A) = \begin{bmatrix} 2 & -5 & 0 \\ -1 & 3 & 0 \\ 0 & 0 & 1/2 \end{bmatrix}$$

$$B = \begin{bmatrix} 7 & 8 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad \mathrm{inv}(B) = \begin{bmatrix} 3 & -4.0 \\ -2.5 & 3.5 \end{bmatrix}$$

$$\begin{bmatrix} 2 & -5 & 0 & 0 & 0 \\ -1 & 3 & 0 & 0 & 0 \\ 0 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 0 & 3 & -4 \\ 0 & 0 & 0 & -2.5 & 3.5 \end{bmatrix} = B$$

5 **10 / 10**

✓ **- 0 pts** Correct

- 3 pts Incorrect partition matrix

- 2 pts Slightly incorrect inverse of partitioned matrix

- 4 pts Incorrect inverse of partitioned matrix

- 1 pts Slightly incorrect inverse of each block or component

- 2 pts Incorrect inverse of each block or component

- 1 pts Incorrect final result

- 10 pts Missing/Incorrect

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7. $\xi x_k = [x_1, \dots, x_k]$ $\qquad G = [\vec{x_1}][x^{T}] = {}^{n}[\vdots]_{n}$

$G_x = X_k X_k^T$

$G_k = X_k X_k^T = X_1 X^T + \dots X_k X_k^T$

$G_{k+1} = X_k X_k^{T} = X_1 X_1^{T} + \dots + X_{k+1} X_{k+1}$

~~leading to $G_{k+1} = G_k + X_{k+1} X_{k+1}$~~

$G_{x+1} = X_k X_k^T + X_{k+1} X_{k+1}^T$

$$G_{xn} = [X_k | X_{k+1}] \begin{bmatrix} X_k^T \\ \hline X_{k+1} \end{bmatrix}$$

9. Lower triangle matrix, inverse of lower triangular matrix is still lower ~~matrix~~ triangular, so it is lower triangular. The identity has zeros above and below pivots.

$$\begin{array}{cc} & n \\ n & \begin{bmatrix} \square & 0 & 0 & 0 \\ * & \square & 0 & 0 \\ * & * & \square & 0 \\ * & * & * & \square \end{bmatrix} \end{array}$$

A is invertible

A^{-1} is lower triangular

Square matrices with pivots ~~are~~ in every column are invertible by definition.

6 7 / 10

- \+ **10 pts** Correct
- ✓ + **4 pts** **partitions Xk , X(Tk) in the correct way**
- ✓ + **3 pts** **correctly multiply two block matrix**
- \+ **3 pts** correctly calculate the difference.
- \+ **0 pts** Wrong or missing answer

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8a) $\begin{bmatrix} A & B \\ C & 0 \end{bmatrix} \begin{bmatrix} I & 0 \\ X & Y \end{bmatrix} = \begin{bmatrix} 0 & I \\ Z & 0 \end{bmatrix}$

$AI + BX = 0$ $\quad A0 + BY = I \quad X = B^{-1}A \quad Z = C$

$CI + 0X = Z \quad CI + 00 = 0 \quad Y = B^{-1}$

b) $\begin{bmatrix} X & 0 \\ Y & Z \end{bmatrix} \begin{bmatrix} A & 0 \\ B & C \end{bmatrix} = \begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$XA + 0B = I \quad X0 + 0C = 0 \quad Y = (A^{-1})(-ZB)$

$YA + ZB = 0 \quad Y0 + ZC = I \quad Z = C^{-1}$

c) $\begin{bmatrix} A & B \\ 0 & I \end{bmatrix} \begin{bmatrix} X & Y & Z \\ 0 & 0 & I \end{bmatrix} = \begin{bmatrix} I & 0 & 0 \\ 0 & 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$Y = 0$

$Z = (A^{-1})(-B)$

10a) $A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix} \quad b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$ $\quad Ly = b$, $Ux = y$

$L = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{bmatrix} \quad U = \begin{bmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

ref(A) $A = \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ -1 & 1 & 0 & 5 \\ 2 & -5 & 1 & 2 \end{array}\right] \quad \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 6 \end{array}\right] \quad \vec{Y} = \begin{bmatrix} -7 \\ -2 \\ 6 \end{bmatrix}$

ref(B) $B = \left[\begin{array}{ccc|c} 3 & -7 & -2 & -7 \\ 0 & -2 & -1 & 5 \\ 0 & 0 & -1 & 2 \end{array}\right] \quad \left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -6 \end{array}\right] \quad \vec{X} = \begin{bmatrix} 3 \\ 4 \\ -6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -2 & -4 & -3 \\ 2 & -7 & -7 & -6 \\ -1 & 2 & 6 & 4 \\ -4 & -1 & 9 & 8 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 7 \\ 0 \\ 3 \end{bmatrix}$ $\quad Ux = y \quad \left[\begin{array}{cccc|c} 1 & -2 & -4 & -3 & 1 \\ 0 & -3 & 1 & 0 & 7 \\ 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

$Ly = b \quad \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 7 \\ -1 & 0 & 1 & 0 & 0 \\ -4 & 3 & -5 & 1 & 3 \end{array}\right]$ $\quad \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right] \quad x = \begin{bmatrix} -2 \\ -1 \\ 2 \\ -3 \end{bmatrix}$

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right] \quad y = \begin{bmatrix} 1 \\ 5 \\ 1 \\ -3 \end{bmatrix}$

7.1 5 / 5

✓ **- 0 pts** Correct

- 5 pts No answer

gradescope

8a) $\begin{bmatrix} A & B \\ C & 0 \end{bmatrix} \begin{bmatrix} I & 0 \\ X & Y \end{bmatrix} = \begin{bmatrix} 0 & I \\ Z & 0 \end{bmatrix}$

$AI + BX = 0$ $\quad A0 + BY = I$ $\quad X = B^{-1}-A$ $\quad Z = C$

$CI + 0X = Z$ $\quad CI + 00 = 0$ $\quad Y = B^{-1}$

b) $\begin{bmatrix} X & 0 \\ Y & Z \end{bmatrix} \begin{bmatrix} A & 0 \\ B & C \end{bmatrix} = \begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$XA + 0B = I$ $\quad X0 + 0C = 0$ $\quad Y = (A^{-1})(-ZB)$

$YA + ZB = 0$ $\quad Y0 + ZC = I$ $\quad Z = C^{-1}$

c) $\begin{bmatrix} A & B \\ 0 & I \end{bmatrix} \begin{bmatrix} X & Y & Z \\ 0 & 0 & I \end{bmatrix} = \begin{bmatrix} I & 0 & 0 \\ 0 & 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$Y = 0$

$Z = (A^{-1})(-B)$

10a) $A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix}$ $\quad b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$ $\quad Ly = b$, $Ux = y$

$L = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{bmatrix}$ $\quad U = \begin{bmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

ref(A) $A = \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ -1 & 1 & 0 & 5 \\ 2 & -5 & 1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 6 \end{array}\right]$ $\quad \vec{Y} = \begin{bmatrix} -7 \\ -2 \\ 6 \end{bmatrix}$

ref(B) $B = \left[\begin{array}{ccc|c} 3 & -7 & -2 & -7 \\ 0 & -2 & -1 & 5 \\ 0 & 0 & -1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -6 \end{array}\right]$ $\quad \vec{x} = \begin{bmatrix} 3 \\ 4 \\ -6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -2 & -4 & -3 \\ 2 & -7 & -7 & -6 \\ -1 & 2 & 6 & 4 \\ -4 & -1 & 9 & 8 \end{bmatrix}$ $\quad b = \begin{bmatrix} 1 \\ 7 \\ 0 \\ 3 \end{bmatrix}$ $\quad Ux = y$ $\left[\begin{array}{cccc|c} 1 & -2 & -4 & -3 & 1 \\ 0 & -3 & 1 & 0 & 7 \\ 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

$Ly = b$ $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 7 \\ -1 & 0 & 1 & 0 & 0 \\ -4 & 3 & -5 & 1 & 3 \end{array}\right]$ $\quad \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$ $\quad x = \begin{bmatrix} -2 \\ -1 \\ 2 \\ -3 \end{bmatrix}$

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right]$ $\quad y = \begin{bmatrix} 1 \\ 5 \\ 1 \\ -3 \end{bmatrix}$

7.2 5 / 5

✓ **- 0 pts** Correct

- 5 pts No answer

gradescope

8a) $\begin{bmatrix} A & B \\ C & 0 \end{bmatrix} \begin{bmatrix} I & 0 \\ X & Y \end{bmatrix} = \begin{bmatrix} 0 & I \\ Z & 0 \end{bmatrix}$

$AI + BX = 0$ $\quad$ $A0 + BY = I$ $\quad$ $X = B^{-1}A$ $\quad Z = C$

$CI + 0X = Z$ $\quad$ $CI + 00 = 0$ $\quad$ $Y = B^{-1}$

b) $\begin{bmatrix} X & 0 \\ Y & Z \end{bmatrix} \begin{bmatrix} A & 0 \\ B & C \end{bmatrix} = \begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$XA + 0B = I$ $\quad$ $X0 + 0C = 0$ $\quad$ $Y = (A^{-1})(-ZB)$

$YA + ZB = 0$ $\quad$ $Y0 + ZC = I$ $\quad$ $Z = C^{-1}$

c) $\begin{bmatrix} A & B \\ 0 & I \end{bmatrix} \begin{bmatrix} X & Y & Z \\ 0 & 0 & I \end{bmatrix} = \begin{bmatrix} I & 0 & 0 \\ 0 & 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$Y = 0$

$Z = (A^{-1})(-B)$

1a) $A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix}$ $\quad b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$ $\quad Ly = b$, $Ux = y$

$L = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{bmatrix}$ $\quad U = \begin{bmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

ref (A) $A = \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ -1 & 1 & 0 & 5 \\ 2 & -5 & 1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 6 \end{array}\right]$ $\quad \vec{Y} = \begin{bmatrix} -7 \\ -2 \\ 6 \end{bmatrix}$

ref(B) $B = \left[\begin{array}{ccc|c} 3 & -7 & -2 & -7 \\ 0 & -2 & -1 & 5 \\ 0 & 0 & -1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -6 \end{array}\right]$ $\quad \vec{X} = \begin{bmatrix} 3 \\ 4 \\ -6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -2 & -4 & -3 \\ 2 & -7 & -7 & -6 \\ -1 & 2 & 6 & 4 \\ -4 & -1 & 9 & 8 \end{bmatrix}$ $\quad b = \begin{bmatrix} 1 \\ 7 \\ 0 \\ 3 \end{bmatrix}$ $\quad Ux = y$ $\left[\begin{array}{cccc|c} 1 & -2 & -4 & -3 & 1 \\ 0 & -3 & 1 & 0 & 7 \\ 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

$Ly = b$ $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 7 \\ -1 & 0 & 1 & 0 & 0 \\ -4 & 3 & -5 & 1 & 3 \end{array}\right]$ $\quad \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$ $\quad x = \begin{bmatrix} -2 \\ -1 \\ 2 \\ -3 \end{bmatrix}$

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right]$ $\quad y = \begin{bmatrix} 1 \\ 5 \\ 1 \\ -3 \end{bmatrix}$

7.3 5 / 5

- ✓ **- 0 pts** Correct
- **- 1.66 pts** Partly Correct
- **- 3.32 pts** Partly Correct
- **- 5 pts** Incorrect
- **- 1 pts** Pages Not Selected or Not Selected Correctly
- **- 5 pts** Missing

gradescope

7. $\xi x_k = [x_1, \dots, x_k]$ $G = [\vec{x_1}][\vec{x}^T] = {}^n[\vdots]_n$

$G_x = X_k X_k^T$

$G_k = X_k X_k^T = X_1 X^T + \dots X_k X_k^T$

$G_{k+1} = X_k X_k^{T} = X_1 X_1^T + \dots + X_{k+1} X_{k+1}$

~~leading to $G_{k+1} = G_{k+1} X_{k+1} X_{k+1}$~~

$G_{k+1} = X_k X_k^T + X_{k+1} X_{k+1}^T$

$G_{xn} = [X_k \mid X_{k+1}] \begin{bmatrix} X_k^T \\ \hline X_{k+1} \end{bmatrix}$

9. Lower triangle matrix, inverse of lower triangular matrix is still lower triangular, so it is lower triangular. The identity has zeros above and below pivots.

$$\begin{array}{cc} & n \\ n & \begin{bmatrix} \square & 0 & 0 & 0 \\ * & \square & 0 & 0 \\ * & * & \square & 0 \\ * & * & * & \square \end{bmatrix} \end{array}$$

A is invertible

A^{-1} is lower trianglar

Square matrixes with pivots in every column are invertible by definition.

8 10 / 10

- ✓ **- 0 pts** Correct
- **- 3 pts** failure to show A is invertible
- **- 3 pts** failure to show A−1 is lower triangular.
- **- 4 pts** failure to show why the operations that reduce A to I change I into a lower triangular matrix.
- **- 10 pts** Wrong or missing answer

gradescope

8a) $\begin{bmatrix} A & B \\ C & 0 \end{bmatrix} \begin{bmatrix} I & 0 \\ X & Y \end{bmatrix} = \begin{bmatrix} 0 & I \\ Z & 0 \end{bmatrix}$

$AI + BX = 0$ $\quad A0 + BY = I$ $\quad X = B^{-1}A$ $\quad Z = C$

$CI + 0X = Z$ $\quad CI + 0Y = 0$ $\quad Y = B^{-1}$

b) $\begin{bmatrix} X & 0 \\ Y & Z \end{bmatrix} \begin{bmatrix} A & 0 \\ B & C \end{bmatrix} = \begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$XA + 0B = I$ $\quad X0 + 0C = 0$ $\quad Y = (A^{-1})(-ZB)$

$YA + ZB = 0$ $\quad Y0 + ZC = I$ $\quad Z = C^{-1}$

c) $\begin{bmatrix} A & B \\ 0 & I \end{bmatrix} \begin{bmatrix} X & Y & Z \\ 0 & 0 & I \end{bmatrix} = \begin{bmatrix} I & 0 & 0 \\ 0 & 0 & I \end{bmatrix}$ $\quad X = A^{-1}$

$Y = 0$

$Z = (A^{-1})(-B)$

10a) $A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix}$ $\quad b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$ $\quad Ly = b$

$Ux = y$

$L = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{bmatrix}$ $\quad U = \begin{bmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

ref(A) $A = \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ -1 & 1 & 0 & 5 \\ 2 & -5 & 1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 6 \end{array}\right]$ $\quad \vec{Y} = \begin{bmatrix} -7 \\ -2 \\ 6 \end{bmatrix}$

ref(B) $B = \left[\begin{array}{ccc|c} 3 & -7 & -2 & -7 \\ 0 & -2 & -1 & 5 \\ 0 & 0 & -1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -6 \end{array}\right]$ $\quad \vec{X} = \begin{bmatrix} 3 \\ 4 \\ -6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -2 & -4 & -3 \\ 2 & -7 & -7 & -6 \\ -1 & 2 & 6 & 4 \\ -4 & -1 & 9 & 8 \end{bmatrix}$ $\quad b = \begin{bmatrix} 1 \\ 7 \\ 0 \\ 3 \end{bmatrix}$ $\quad Ux = y$ $\left[\begin{array}{cccc|c} 1 & -2 & -4 & -3 & 1 \\ 0 & -3 & 1 & 0 & 7 \\ 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

$Ly = b$ $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 7 \\ -1 & 0 & 1 & 0 & 0 \\ -4 & 3 & -5 & 1 & 3 \end{array}\right]$ $\quad \left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$ $\quad x = \begin{bmatrix} -2 \\ -1 \\ 2 \\ 2 \\ -3 \end{bmatrix}$

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right]$ $\quad y = \begin{bmatrix} 1 \\ 5 \\ 1 \\ -3 \end{bmatrix}$

9.1 5 / 5

- ✓ **- 0 pts** Correct
- **- 5 pts** Incorrect
- **- 1 pts** Pages Not Selected Or Pages Not Selected Correctly
- **- 5 pts** Missing

gradescope

8a) $\begin{bmatrix} A & B \\ C & 0 \end{bmatrix} \begin{bmatrix} I & 0 \\ X & Y \end{bmatrix} = \begin{bmatrix} 0 & I \\ Z & 0 \end{bmatrix}$

$AI + BX = 0$ $\quad$ $A0 + BY = I$ $\quad$ $X = B^{-1}A$ $\quad$ $Z = C$

$CI + 0X = Z$ $\quad$ $CI + 00 = 0$ $\quad$ $Y = B^{-1}$

b) $\begin{bmatrix} X & 0 \\ Y & Z \end{bmatrix} \begin{bmatrix} A & 0 \\ B & C \end{bmatrix} = \begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}$ $\quad$ $X = A^{-1}$

$XA + 0B = I$ $\quad$ $X0 + 0C = 0$ $\quad$ $Y = (A^{-1})(-ZB)$

$YA + ZB = 0$ $\quad$ $Y0 + ZC = I$ $\quad$ $Z = C^{-1}$

c) $\begin{bmatrix} A & B \\ 0 & I \end{bmatrix} \begin{bmatrix} X & Y & Z \\ 0 & 0 & I \end{bmatrix} = \begin{bmatrix} I & 0 & 0 \\ 0 & 0 & I \end{bmatrix}$ $\quad$ $X = A^{-1}$

$Y = 0$

$Z = (A^{-1})(-B)$

1(a) $A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix}$ $\quad$ $b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$ $\quad$ $Ly = b$, $Ux = y$

$L = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{bmatrix}$ $\quad$ $U = \begin{bmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

rref(A) $A = \left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ -1 & 1 & 0 & 5 \\ 2 & -5 & 1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -7 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 6 \end{array}\right]$ $\quad$ $\vec{y} = \begin{bmatrix} -7 \\ -2 \\ 6 \end{bmatrix}$

rref(B) $B = \left[\begin{array}{ccc|c} 3 & -7 & -2 & -7 \\ 0 & -2 & -1 & 5 \\ 0 & 0 & -1 & 2 \end{array}\right]$ $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -6 \end{array}\right]$ $\quad$ $\vec{x} = \begin{bmatrix} 3 \\ 4 \\ -6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & -2 & -4 & -3 \\ 2 & -7 & -7 & -6 \\ -1 & 2 & 6 & 4 \\ -4 & -1 & 9 & 8 \end{bmatrix}$ $\quad$ $b = \begin{bmatrix} 1 \\ 7 \\ 0 \\ 3 \end{bmatrix}$ $\quad$ $Ux = y$ $\left[\begin{array}{cccc|c} 1 & -2 & -4 & -3 & 1 \\ 0 & -3 & 1 & 0 & 7 \\ 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$

$Ly = b$ $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 2 & 1 & 0 & 0 & 7 \\ -1 & 0 & 1 & 0 & 0 \\ -4 & 3 & -5 & 1 & 3 \end{array}\right]$ $\quad$ $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 3 \end{array}\right]$ $\quad$ $x = \begin{bmatrix} -2 \\ -1 \\ 2 \\ -3 \end{bmatrix}$

$\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -3 \end{array}\right]$ $\quad$ $y = \begin{bmatrix} 1 \\ 5 \\ 1 \\ -3 \end{bmatrix}$

9.2 **5 / 5**

✓ **- 0 pts** **Correct**

- 5 pts Incorrect

- 1 pts Pages not selected or not selected correctly

- 5 pts Missing

gradescope

Editor - findTranspose.m

findTranspose.m | findInverseOf2x2Matrix.m

```
%x is the input vector or matrix. You can find the
%size that is the number of rows and the number
%of columns of x by using the size function in MATLAB
function transpose_ret = findTranspose(x)
trans=zeros(size(x));
numcol=size(x,2);
for i=1:numcol
trans(:,i)=x(i,:);
end
%transpose_ret is the variable that will contain the transpose of the input x
```

10.1 5 / 5

✓ **- 0 pts** Correct

- 5 pts No answer

gradescope

Advance

Advance

RUN

mand Window

Editor - findInverseOf2x2Matrix.m

findTranspose.m findInverseOf2x2Matrix.m

```
function inverse_ret = findInverse(x)
if i(1,1) == 0 && i(2,1) == 0 || i(2,1) == 0 && i(2,2) == 0
    dis('Error');
        return
end

x = eye(2);
if i(1,1) == 0 | A(2,2) == 0;
    x = (0 1; 1 0) * x;
    i = (0 1; 1 0) * i;
end

if i(2,1) == 0
    x = (1 0; -i(2,1) 1)*x;
    i = (1 0; -i(2,1) * i;
end

if i(1,1) == 0
    x = (1/i(1,1) 0; 0 1) * x;
    i = (1/i(1,1) 0; 0 1) * i;
end

if i(1,2) == 0
    x = (1 -i(1,2); 0 1) * x;
    i = (1 -i(1,2); 0 1) * i;
end

if i(2,2) == 0
    x = (1 0; 0 1/i(2,2))*x;
    i = (1 0; 0 1/i(2,2) *i;
end
```

10.2 **5 / 5**

✓ **- 0 pts** Correct

- 5 pts No answer

gradescope