Gaussian Elimination

Practice Quiz • 20 min • 3 total points

Congratulations! You passed!

Grade received 100% **To pass** 100% or higher

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1. Perform Gaussian elimination without row interchange on the following augmented matrix: **1 / 1 point**

$$\begin{pmatrix} 1 & -2 & 1 & 0 \\ 2 & 1 & -3 & 5 \\ 4 & -7 & 1 & -2 \end{pmatrix}$$

Which matrix can be the result?

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

Correct

2. Which matrix is not in reduced row echelon form? **1 / 1 point**

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

Correct

3. The inverse of $\begin{pmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{pmatrix}$ is **1 / 1 point**

- [◯] $\begin{pmatrix} 4/3 & 2/3 & 1/2 \\ 2 & 1 & 1/2 \\ -3 & -5 & -1 \end{pmatrix}$
- ( ) $\begin{pmatrix} 2/3 & 1/2 & 4/3 \\ 1 & 1/2 & 2 \\ -3 & -5 & -1 \end{pmatrix}$
- ( ) $\begin{pmatrix} 2/3 & 4/3 & 1/2 \\ 1 & 2 & 1/2 \\ -5 & -3 & -1 \end{pmatrix}$
- (●) $\begin{pmatrix} 2/3 & 4/3 & 1/2 \\ 1 & 2 & 1/2 \\ -3 & -5 & -1 \end{pmatrix}$

Correct

LU Decomposition

Practice Quiz • 15 min • 3 total points

Congratulations! You passed!

Grade received 100% **To pass** 100% or higher

Go to next item

1. Which of the following is the elementary matrix that multiplies the second row of a four-by-four matrix by 2 and adds the result to the third row? **1 / 1 point**

- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 2 & 0 & 0 & 1 \end{pmatrix}$

Correct

2. Which of the following is the LU decomposition of $\begin{pmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{pmatrix}$? **1 / 1 point**

- ○ $\begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1/2 \end{pmatrix} \begin{pmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -2 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{pmatrix} \begin{pmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ -1 & 2 & -1 \\ 2 & -10 & 6 \end{pmatrix} \begin{pmatrix} 3 & -7 & -2 \\ 0 & -1 & -1 \\ 0 & 0 & -1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 4 & -5 & 1 \end{pmatrix} \begin{pmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ -6 & 14 & 3 \end{pmatrix}$

Correct

3. Suppose $\mathrm{L} = \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -5 & 1 \end{pmatrix}, \mathrm{U} = \begin{pmatrix} 3 & -7 & -2 \\ 0 & -2 & -1 \\ 0 & 0 & -1 \end{pmatrix}$, and $\mathrm{b} = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$. Solve $\mathrm{LUx} = \mathrm{b}$ by letting $\mathrm{y} = \mathrm{Ux}$. The solutions for y and x are

1 / 1 point

- ○ $\mathrm{y} = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}, \mathrm{x} = \begin{pmatrix} 1/6 \\ 1/2 \\ -1 \end{pmatrix}$
- ◉ $\mathrm{y} = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}, \mathrm{x} = \begin{pmatrix} -1/6 \\ -1/2 \\ 1 \end{pmatrix}$
- ○ $\mathrm{y} = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}, \mathrm{x} = \begin{pmatrix} 1/6 \\ -1/2 \\ 1 \end{pmatrix}$
- ○ $\mathrm{y} = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}, \mathrm{x} = \begin{pmatrix} -1/6 \\ 1/2 \\ 1 \end{pmatrix}$

✓ Correct

Week Two Assessment
Graded Quiz • 30 min

Congratulations! You passed!

Grade received	Latest Submission Grade	To pass
100%	100%	60% or higher

Go to next item

1. The system of equations given by

1 / 1 point

$$2x_1 + 2x_2 + x_3 = 5,$$
$$x_1 + 3x_2 + x_3 = 2,$$
$$3x_1 + 4x_2 + 5x_3 = 1,$$

is written in matrix form as

- ○ $\begin{pmatrix} 2 & 1 & 3 \\ 2 & 3 & 4 \\ 1 & 1 & 5 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \\ 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 3 & 4 & 5 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \\ 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 2 & 2 & 1 & 5 \\ 1 & 3 & 1 & 2 \\ 3 & 4 & 5 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$
- ○ $\begin{pmatrix} x_1 & x_2 & x_3 \end{pmatrix} \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 3 & 4 & 5 \end{pmatrix} = \begin{pmatrix} 5 & 2 & 1 \end{pmatrix}$

✓ Correct

2. The augmented matrix for the system of equations

1 / 1 point

$$2x_1 + 2x_2 + x_3 = 5,$$

$$x_1 + 3x_2 + x_3 = 2,$$

$$3x_1 + 4x_2 + 5x_3 = 1,$$

is given by

- ○ $\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 3 & 4 & 5 \end{pmatrix}$
- ○ $\begin{pmatrix} 2x_1 & 2x_2 & x_3 & 5 \\ x_1 & 3x_2 & x_3 & 2 \\ 3x_1 & 4x_2 & 5x_3 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 2 & 2 & 1 & 5 \\ 1 & 3 & 1 & 2 \\ 3 & 4 & 5 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 5 & 2 & 2 & 1 \\ 2 & 1 & 3 & 1 \\ 1 & 3 & 4 & 5 \end{pmatrix}$

✓ **Correct**

3. Perform Gaussian elimination without row interchange on the following augmented matrix:

1 / 1 point

$$\begin{pmatrix} 1 & 2 & -1 & 2 \\ 2 & 6 & 3 & 7 \\ 1 & 4 & 2 & 9 \end{pmatrix}.$$

Which matrix can be the result?

- ○ $\begin{pmatrix} 1 & 2 & -1 & 2 \\ 0 & 2 & 5 & 3 \\ 0 & 0 & 2 & 4 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 2 & -1 & 2 \\ 0 & 2 & 5 & 3 \\ 0 & 0 & -2 & 4 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 2 & -1 & 2 \\ 0 & 2 & 5 & 3 \\ 0 & 0 & 4 & 2 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 2 & -1 & 2 \\ 0 & 2 & 5 & 3 \\ 0 & 0 & -4 & 2 \end{pmatrix}$

✓ **Correct**

4. Which matrix is not in reduced row echelon form? **1 / 1 point**

- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$

✓ **Correct**

5. The inverse of $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ is **1 / 1 point**

- ○ $\begin{pmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ -1 & 1 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ 1 & -1 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & -1 \end{pmatrix}$

✓ **Correct**

6. Which of the following is the elementary matrix that multiplies the third row of a four-by-four matrix by 2 and adds the result to the fourth row? **1 / 1 point**

- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 2 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 2 & 0 & 0 & 1 \end{pmatrix}$

✓ Correct

7. Which of the following is the LU decomposition of $\begin{pmatrix} 2 & -2 & 1 \\ 4 & -2 & 3 \\ -4 & 8 & -2 \end{pmatrix}$? **1 / 1 point**

- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -2 & 2 & 1/2 \end{pmatrix} \begin{pmatrix} 2 & -2 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & -4 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -2 & 2 & 1 \end{pmatrix} \begin{pmatrix} 2 & -2 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & -2 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 1/2 \\ -2 & 2 & 2 \end{pmatrix} \begin{pmatrix} 2 & -2 & 1 \\ 0 & 2 & 2 \\ 0 & 0 & -2 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -2 & 1 & 1 \end{pmatrix} \begin{pmatrix} 2 & -2 & 1 \\ 0 & 2 & 1 \\ 0 & 2 & -1 \end{pmatrix}$

✓ Correct

8. Suppose $L = \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ -2 & -5 & 1 \end{pmatrix}, U = \begin{pmatrix} 6 & -7 & 2 \\ 0 & -7 & -1 \\ 0 & 0 & -1 \end{pmatrix}$, and $b = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$. Solve $LUx = b$ by letting $y = Ux$. The solutions for y and x are

1 / 1 point

- ○ $y = \begin{pmatrix} 1 \\ 1 \\ 8 \end{pmatrix}, x = \begin{pmatrix} 1 \\ 4 \\ -8 \end{pmatrix}$
- ◉ $y = \begin{pmatrix} 1 \\ 1 \\ 8 \end{pmatrix}, x = \begin{pmatrix} 4 \\ 1 \\ -8 \end{pmatrix}$
- ○ $y = \begin{pmatrix} 8 \\ 1 \\ 1 \end{pmatrix}, x = \begin{pmatrix} 1 \\ 4 \\ -8 \end{pmatrix}$
- ○ $y = \begin{pmatrix} 8 \\ 1 \\ 1 \end{pmatrix}, x = \begin{pmatrix} 4 \\ 1 \\ -8 \end{pmatrix}$

✓ Correct

9. Suppose $M = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 3 & 1 \end{pmatrix}$. Which matrix is M^{-1}?

1 / 1 point

- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 3 & 1 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -3 & 1 \end{pmatrix}$

✓ Correct

10. From Gaussian elimination, one obtains $M_3M_2M_1A = U$, where U is upper triangular. If $A = LU$, which is the lower triangular matrix L?

1 / 1 point

- ○ $M_1M_2M_3$
- ○ $M_3M_2M_1$
- ◉ $M_1^{-1}M_2^{-1}M_3^{-1}$
- ○ $M_3^{-1}M_2^{-1}M_1^{-1}$

✓ Correct