

This quiz contains problems on the front and back of this page! Use the following matrices for problems 1 and 2 on this quiz. If I ask you to multiply or add two matrices that can't be multiplied because of their sizes being wrong, just say "Can't do" for your answer.

$$A = \begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -4 \\ 3 & 7 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & -2 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \end{bmatrix} \quad E = \begin{bmatrix} -1 & 2 \\ 3 & -4 \\ 2 & -1 \end{bmatrix}$$

1. Perform the indicated matrix operations using the matrices given above:

a)  $A + B$

b)  $3 \cdot D - C$

c)  $C - A$

$$\begin{bmatrix} 4 & -1 \\ -1 & 12 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 4 & 6 \\ 13 & 17 & 23 \end{bmatrix}$$

Can't do ✓

2. Perform the indicated matrix operations using the matrices given above:

a)  $A * C$

b)  $C * A$

$$\begin{bmatrix} 8 & 7 & 0 \\ 6 & -3 & -22 \end{bmatrix}$$

Can't do

3. For the given system of equations, find the solution using any MATRIX method of your choice. SHOW YOUR WORK!!! I MUST be able to see the method you are using!!! If all you do is write an answer, you will NOT receive any credit for the problem!!!

$$4x - 3y = 19$$

$$-2x + y = -9$$

$$\text{or } A^{-1} = \frac{1}{(4)(1) - (-3)(-2)} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} = -\frac{1}{2} \cdot \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} 19 \\ -9 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} -8 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -3 & | & 19 \\ -2 & 1 & | & -9 \end{bmatrix} \xrightarrow{\times(2)} \begin{bmatrix} 4 & -3 & | & 19 \\ -2 & 1 & | & -9 \end{bmatrix} \xrightarrow{\times(2)} \begin{bmatrix} 4 & -3 & | & 19 \\ -4 & 2 & | & -18 \end{bmatrix} \xrightarrow{\times(2)} \begin{bmatrix} 4 & -3 & | & 19 \\ 0 & -4 & | & -17 \end{bmatrix} \xrightarrow{\times(-1/4)} \begin{bmatrix} 1 & -3/4 & | & 19/4 \\ 0 & -4 & | & -17 \end{bmatrix} \xrightarrow{\times(-1/4)} \begin{bmatrix} 1 & -3/4 & | & 19/4 \\ 0 & 1 & | & 17/4 \end{bmatrix} \xrightarrow{\times(3/4)} \begin{bmatrix} 1 & 0 & | & 4 \\ 0 & 1 & | & 17/4 \end{bmatrix}$$

$$\begin{cases} x = 4 \\ y = -1 \end{cases}$$

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$$A = \begin{bmatrix} 3 & 4 \\ -1 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 5 \\ -2 & 5 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -1 & 2 \end{bmatrix} \quad D = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & -4 \end{bmatrix} \quad E = \begin{bmatrix} 1 & -2 \\ 2 & -3 \\ 2 & -1 \end{bmatrix}$$

1. Perform the indicated matrix operations using the matrices given above:

a)  $A - B$

b)  $C - A$

c)  $2 \cdot D - C$

$$\begin{bmatrix} 0 & -1 \\ 1 & 2 \end{bmatrix}$$

Can't Do

$$\begin{bmatrix} -3 & 2 & 3 \\ 1 & 11 & -10 \end{bmatrix}$$

2. Perform the indicated matrix operations using the matrices given above:

a)  $C * A$

b)  $A * C$

Can't Do

$$\begin{bmatrix} 15 & 2 & 17 \\ 20 & -9 & 11 \end{bmatrix}$$

3. For the given system of equations, find the solution using any MATRIX method of your choice. SHOW YOUR WORK!!! I MUST be able to see the method you are using!!! If all you do is write an answer, you will NOT receive any credit for the problem!!!

$$\begin{aligned} 4x - 3y &= -29 \\ -2x + y &= 13 \end{aligned}$$

$$A^{-1} = \frac{1}{(4)(1) - (-3)(-2)} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} = \frac{-1}{2} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} -29 \\ 13 \end{bmatrix} = \frac{-1}{2} \begin{bmatrix} 10 \\ -6 \end{bmatrix}$$

$$\begin{aligned} &\xrightarrow{\times 2} \left[ \begin{array}{cc|c} 4 & -3 & -29 \\ -2 & 1 & 13 \end{array} \right] \rightarrow \left[ \begin{array}{cc|c} 1 & -3/4 & -29/4 \\ 0 & 3/4 & 9/4 \end{array} \right] \\ &\xrightarrow{\times (3/4)} \left[ \begin{array}{cc|c} 1 & 0 & -5 \\ 0 & 1 & 3 \end{array} \right] \end{aligned}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -5 \\ 3 \end{bmatrix}$$

$x = -5$

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$$A = \begin{bmatrix} 3 & -4 \\ 1 & -6 \end{bmatrix} \quad B = \begin{bmatrix} 3 & -4 \\ -2 & 7 \end{bmatrix} \quad C = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 1 & -3 \end{bmatrix} \quad D = \begin{bmatrix} -1 & 2 & -3 \\ 2 & 5 & 4 \end{bmatrix} \quad E = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 1 & -5 \end{bmatrix}$$

$$2D = \begin{bmatrix} -2 & 4 & -6 \\ 4 & 10 & 8 \end{bmatrix}$$

1. Perform the indicated matrix operations using the matrices given above:

a)  $A - B$

b)  $C - A$

c)  $2 \cdot D - C$

$$\begin{bmatrix} 0 & 0 \\ 3 & -13 \end{bmatrix}$$

Can't Do

$$\begin{bmatrix} -3 & 6 & -9 \\ 1 & 9 & 11 \end{bmatrix}$$

2. Perform the indicated matrix operations using the matrices given above:

a)  $C * A$   
 $2 \times 3 \quad 2 \times 2$

b)  $A * C$   
 $2 \times 2 \quad 2 \times 3$

Can't Do

$$\begin{bmatrix} -9 & -10 & 21 \\ -17 & -8 & 21 \end{bmatrix}$$

3. For the given system of equations, find the solution using any MATRIX method of your choice. SHOW YOUR WORK!!! I MUST be able to see the method you are using!!! If all you do is write an answer, you will NOT receive any credit for the problem!!!

$$\begin{aligned} 4x - 3y &= 33 \\ -2x + y &= -13 \end{aligned}$$

$$A^{-1} = \frac{1}{4 - (-3)(-2)} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

$$A^{-1} \cdot B = -\frac{1}{2} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} 33 \\ -13 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} (1)(33) + 3(-13) \\ (2)(33) + 4(-13) \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} -6 \\ 14 \end{bmatrix}$$

$$\left[ \begin{array}{cc|c} 4 & -3 & 33 \\ 2 & -3/2 & 33/2 \\ -2 & 1 & -13 \end{array} \right] \xrightarrow{R_2 \leftrightarrow R_1} \left[ \begin{array}{cc|c} 1 & -3/4 & 33/4 \\ 0 & 3/4 & 21/4 \\ 0 & -1/2 & 7/2 \end{array} \right] \xrightarrow{R_2 \times 4, R_3 \times 4} \left[ \begin{array}{cc|c} 1 & 0 & 3 \\ 0 & 1 & -7 \end{array} \right]$$

$$= \begin{bmatrix} 3 \\ -7 \end{bmatrix}$$

$$\begin{cases} x - y + 2z = 4 \\ x + 4y + z = 4 \\ 2x + 2y + 4z = 10 \end{cases}$$

$$\left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 1 & 4 & 1 & 4 \\ 2 & 2 & 4 & 10 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ -1 & 5 & -1 & 0 \\ 1 & 4 & 1 & 4 \\ -2 & 2 & 4 & 10 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 5 & -1 & 0 \\ 0 & 4 & 0 & 2 \\ -2 & 2 & 4 & 10 \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 1 & -\frac{1}{5} & 0 \\ 0 & 4 & 0 & 2 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 1 & -\frac{1}{5} & 0 \\ 0 & 0 & -\frac{4}{5} & 2 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 0 & \frac{9}{5} & 4 \\ 0 & 1 & -\frac{1}{5} & 0 \\ 0 & 0 & -\frac{4}{5} & 2 \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 0 & \frac{9}{5} & 4 \\ 0 & 1 & -\frac{1}{5} & 0 \\ 0 & 0 & 1 & \frac{5}{2} \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & 0 & \frac{9}{5} & 4 \\ 0 & 1 & -\frac{1}{5} & 0 \\ 0 & 0 & 1 & \frac{5}{2} \end{array} \right] \rightarrow \left[ \begin{array}{ccc|c} 1 & 0 & 0 & -\frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{5}{2} \end{array} \right]$$

# Review for Final

Dec. 2, 2000  
Wednesday

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1/2 credit for Algebraic formula used on Matrices

$$10) \begin{cases} x - y + 2z = 4 \\ x + 4y + z = 4 \\ 2x + 2y + 4z = 10 \end{cases}$$

$$\left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 1 & 4 & 1 & 4 \\ 2 & 2 & 4 & 10 \end{array} \right]$$

↑

↑

Coefficient

Constant

Step 1:

Step 2:

$$\begin{array}{l} \begin{array}{l} \times -1 \\ \times -2 \end{array} \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 1 & 4 & 1 & 4 \\ 2 & 2 & 4 & 10 \end{array} \right] \begin{array}{l} \leftarrow \text{Add} \\ \leftarrow \text{Add} \\ \leftarrow \text{Add} \end{array} \\ \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 5 & -1 & 0 \\ 0 & 4 & 0 & 2 \end{array} \right] \rightarrow \text{Divide by 5} \end{array}$$

Step 3:

Step 4:

$$\begin{array}{l} \times 1 \\ \times 4 \end{array} \left[ \begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 1 & -1/5 & 0 \\ 0 & 4 & 0 & 2 \end{array} \right] \begin{array}{l} \leftarrow \text{Add} \\ \leftarrow \text{Add} \end{array} \\ \left[ \begin{array}{ccc|c} 1 & 0 & 9/5 & 4 \\ 0 & 1 & -1/5 & 0 \\ 0 & 0 & 4/5 & 2 \end{array} \right] \rightarrow \text{Multiply by } 5/4$$

Step 5:

Step 6:

$$\begin{array}{l} \times 5 \\ \times 5 \end{array} \left[ \begin{array}{ccc|c} 1 & 0 & 9/5 & 4 \\ 0 & 1 & -1/5 & 0 \\ 0 & 0 & 1 & 5/2 \end{array} \right] \begin{array}{l} \leftarrow \text{Add} \\ \leftarrow \text{Add} \end{array} \\ \left[ \begin{array}{ccc|c} 1 & 0 & 0 & -1/2 \\ 0 & 1 & 0 & 1/2 \\ 0 & 0 & 1 & 5/2 \end{array} \right]$$

$$\left. \begin{array}{l} x = -1/2 \\ y = 1/2 \\ z = 5/2 \end{array} \right\}$$

ANSWER

If first line does not begin with 1;  
divide line by 1st number to get 1  
then replace line with 0's and 1's

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30)

$$x - 2y = 4$$

$$-3x + 10y = 24$$

$$A = \begin{bmatrix} 1 & -2 \\ -3 & 10 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 \\ 24 \end{bmatrix}$$

$$\text{Find } A^{-1} = \frac{1}{(1)(10) - (-2)(-3)} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix}$$

$$\text{Sol} = A^{-1} \cdot B$$

$$\frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 24 \end{bmatrix}$$

$\begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix}$  is  $2 \times 2$       $\begin{bmatrix} 4 \\ 24 \end{bmatrix}$  is  $2 \times 1$

$$\frac{1}{4} \begin{bmatrix} 40 + 48 \\ 12 + 24 \end{bmatrix}$$

$\begin{bmatrix} 40 + 48 \\ 12 + 24 \end{bmatrix}$  is  $2 \times 1$

$(10 \times 4) + (2 \times 24)$   
 $(3 \times 4) + (1 \times 24)$

$$\frac{1}{4} \begin{bmatrix} 88 \\ 36 \end{bmatrix} = \begin{bmatrix} 22 \\ 9 \end{bmatrix}$$

30(b)

$$x - 2y = 5$$

$$-3x - 10y = 11$$

$$\frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix} \cdot \begin{bmatrix} 5 \\ 11 \end{bmatrix} = \frac{1}{4} \begin{bmatrix} 72 \\ 26 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 36 \\ 13 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 18 \\ 6.5 \end{bmatrix}$$

multiply matrix

$$2 \times 2 \cdot 3 \times 2$$

have to be the same

$$\begin{bmatrix} 1 & 2 & 4 \\ -3 & 1 & 5 \end{bmatrix} \begin{matrix} \times \\ \times \\ \times \end{matrix} \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & -2 & 1 \end{bmatrix} \begin{matrix} \text{Add together} \\ \downarrow \\ \text{Add together} \end{matrix} = \begin{bmatrix} 17 & 2 & 9 \\ 14 & -12 & -9 \end{bmatrix}$$

$2 \times 3 \qquad 3 \times 3 \qquad 2 \times 3$

How much do I need in an account to withdraw \$350 at the beginning of each month for 15 years if the account pays 7.2%?

present value Annuity Due

If I put \$350 into an account paying 7.2% at the end of each month for 15 years, how much will I have?

future value ordinary Annuity

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(Find the inverse matrix)

$$30) \begin{cases} x - 2y = 4 \\ -3 + 10y = 24 \end{cases}$$

$$A = \begin{bmatrix} 1 & -2 \\ -3 & 10 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 \\ 24 \end{bmatrix}$$

Definitely  
problem like  
this on final

$$\text{find } A^{-1} = \frac{1}{(1)(10) - (-2)(-3)} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix}$$

$10 - 6$

A  
INVERSE  $\rightarrow$

$$A^{-1} = \frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix}$$

Solution:  
 $A^{-1} \cdot B$

$$\frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 24 \end{bmatrix} = \frac{1}{4} \begin{bmatrix} 10 \times 4 & 2 \times 24 \\ 3 \times 4 & 1 \times 24 \end{bmatrix} = \frac{1}{4} \begin{bmatrix} 40 + 48 \\ 12 + 24 \end{bmatrix} =$$

$$\frac{1}{4} \begin{bmatrix} 88 \\ 36 \end{bmatrix} = \begin{bmatrix} 22 \\ 9 \end{bmatrix} \quad \text{or } \begin{cases} x = 22 \\ y = 9 \end{cases}$$

$$30b) \begin{cases} x - 2y = 5 \\ -3x + 10y = 11 \end{cases} = A^{-1} = \frac{1}{4} \begin{bmatrix} 10 & 2 \\ 3 & 1 \end{bmatrix} \cdot \begin{bmatrix} 5 \\ 11 \end{bmatrix} =$$

$$\frac{1}{4} \begin{bmatrix} 50 + 22 \\ 15 + 11 \end{bmatrix} = \frac{1}{4} \begin{bmatrix} 72 \\ 26 \end{bmatrix} =$$

$$\frac{1}{2} \begin{bmatrix} 36 \\ 13 \end{bmatrix} \quad \text{or } \begin{bmatrix} 18 \\ 6.5 \end{bmatrix}$$

Do NOT  
leave answers  
unsimplified

$$\begin{bmatrix} 1 & 2 & 4 \\ -3 & 1 & 5 \end{bmatrix} \begin{matrix} 2 \times 3 \\ \textcircled{2} \times 3 \end{matrix} \times \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & -2 & -1 \end{bmatrix} \begin{matrix} 3 \times 3 \\ \textcircled{3} \times 3 \end{matrix} = \begin{bmatrix} \square & 2 & 9 \\ -4 & -12 & -9 \\ -2 & 2 & -2 \end{bmatrix} \begin{matrix} 1+4+12 & 2+8+8 & 3+10+4 \\ 1,1 & 1,2 & 1,3 \\ 2,1 & 2,2 & 2,3 \end{matrix} \quad \text{EXAMPLE}$$

INSIDE NUMBERS MUST MATCH UP FOR MULTIPLICATION OF MATRICES TO WORK; IF inside numbers do not match MULTIPLICATION CANNOT BE DONE!!

PMNTS @ END ORDINARY ANNUITY

PMNTS @ BEGINNING ANNUITY/DUE

How much do I need in an account to withdraw \$350 @ the beginning of each month for 15 yrs if the account pays 7.2%?

Present Value - Annuity Due  
 ↑  
 Beginning

If I put \$350 into an account paying 7.2% @ the end of each month for 15 yrs, how much will I have?

Future Value Ordinary Annuity  
 ↑  
 End