CONQUER E{x}AMS WiTH

Scientific Calculator Keystrokes

VOLUME 1

Nastasa binti Abdul Samat
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POLITEKNIK
MALAYSIA
PORT DICKSON

Conquer Exams with Scientific Calculator Keystrokes

VOLUME 1

1st Edition

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Preface

Assalamualaikum and Warm Greatings to all respected readers,

The ***Conquer Exams with Scientific Calculator Keystrokes Volume 1*** is prepared as a practical academic reference to help students master the use of scientific calculators, turning them into powerful allies during exams.

This book focuses on providing clear, step-by-step instructions and practical examples that demonstrate how to use key calculator functions effectively focusing in solving matrices. Mastering calculator keystrokes is not just a technical skill but a strategic advantage that can boost both speed and accuracy in exams.

It is hoped that this book will serve as a practical and accessible resource for students, empowering them to tackle exams with greater confidence and precision.

Prepared and published under the supervision of Department of Mathematics, Science and Computer, Politeknik Port Dickson.

The Authors

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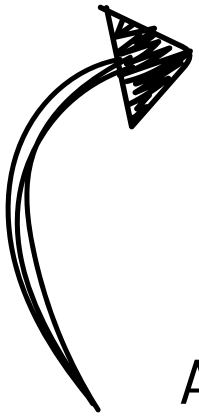
scientific calculator

Discover Learning Beyond The Page!

This book features Augmented Reality (AR) that turns static images into practical and visual tutorials. Just scan the QR code and explore. Let's make learning interactive!

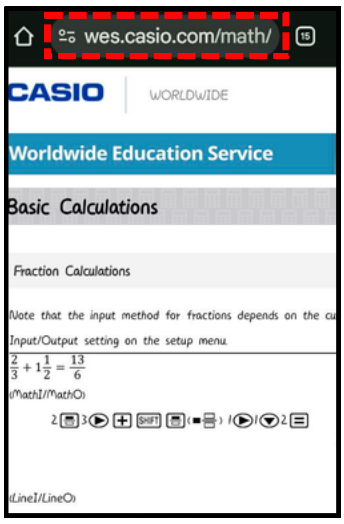
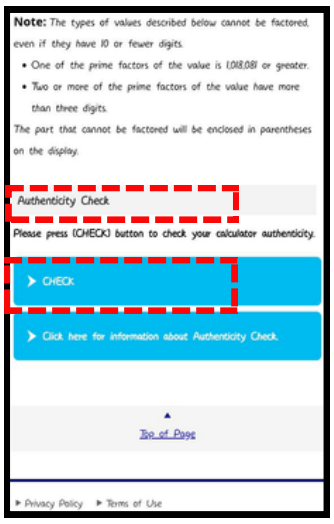


Align your device's camera with the QR code to launch the AR experience

CALCULATOR ORIGINALITY

MATRICES

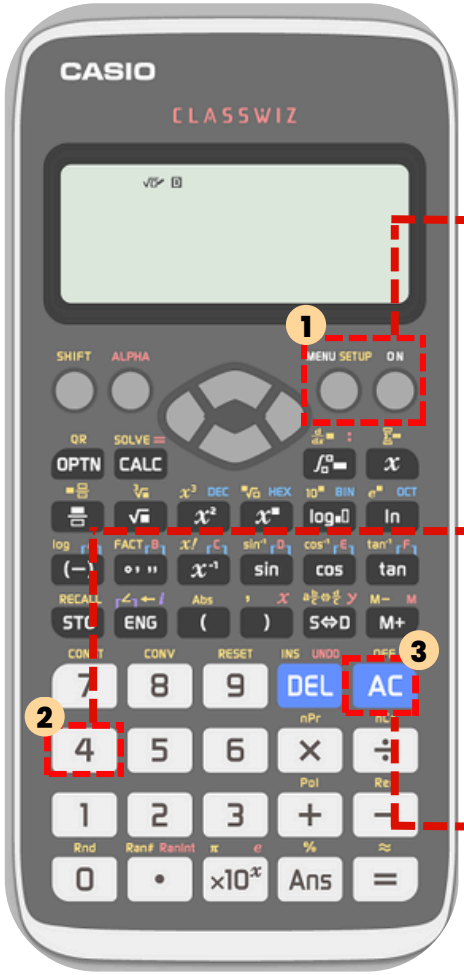
How to Check Your Calculator Originality

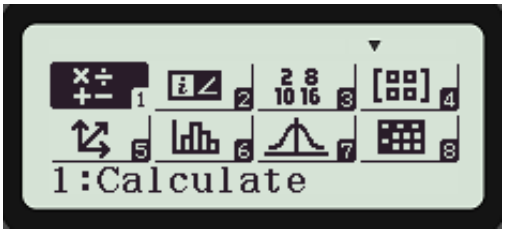
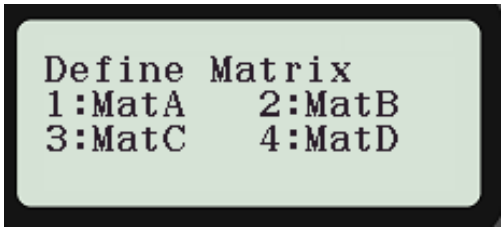
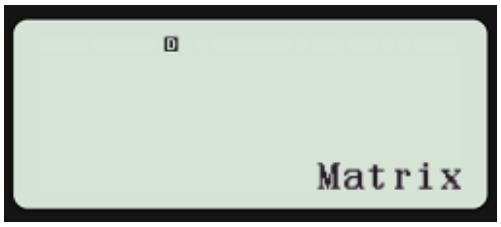
	Command	Display
1	**Display the QR Code on the calculator** Press ON Click Menu Click Shift Click 'OPTN'	
2	**Read the QR Code with a smartphone or tablet** Scan the QR Scroll down until you find Authenticity Check Click 'Check'	 
3	Check the result authenticity	 

MATRIX MODE

MATRICES

Change Calculator to Matrix Mode



	Command	Display
1	Click 'ON' Click 'MENU'	
2	Click '4'	
3	Click 'AC'	

DEFINE MATRIX

MATRICES

Define 2 x 2 Matrix

2 x 2 Matrix

$$\text{Mat A} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Make sure your calculator in Matrix Mode.
(refer Page 1)

	Command	Display
1	Click 'OPTN'	1:Define Matrix 2:Edit Matrix 3:MatA 4:MatB 5:MatC 6:MatD
2	Click 1	
3	Click 1 again	Define Matrix 1:MatA 2:MatB 3:MatC 4:MatD
4	Insert number of rows Click no 2	MatA Number of Rows? Select 1~4
5	Insert number of columns Click no 2	MatA Number of Columns? Select 1~4

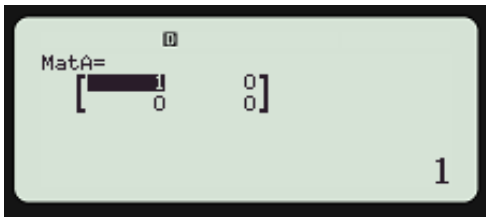
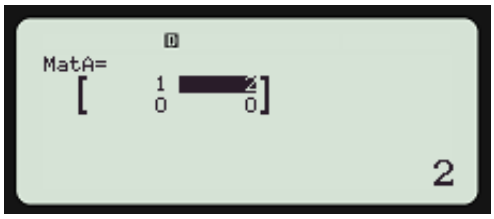
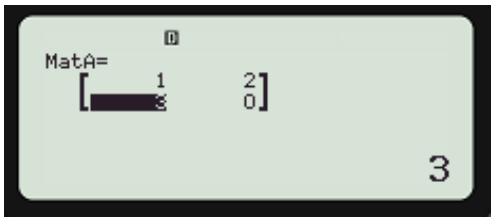
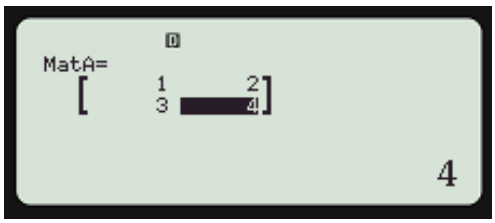
MATRICES

Define 2 x 2 Matrix

2 x 2 Matrix

Mat A = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

a_{11} a_{12} a_{21} a_{22}

	Command	Display
6	**Insert the matrix value for a_{11}** Click no 1 Click =	
7	**Insert the matrix value for a_{12}** Click no 2 Click =	
8	**Insert the matrix value for a_{21}** Click no 3 Click =	
9	**Insert the matrix value for a22** Click no 4 Click = Click 'AC'	

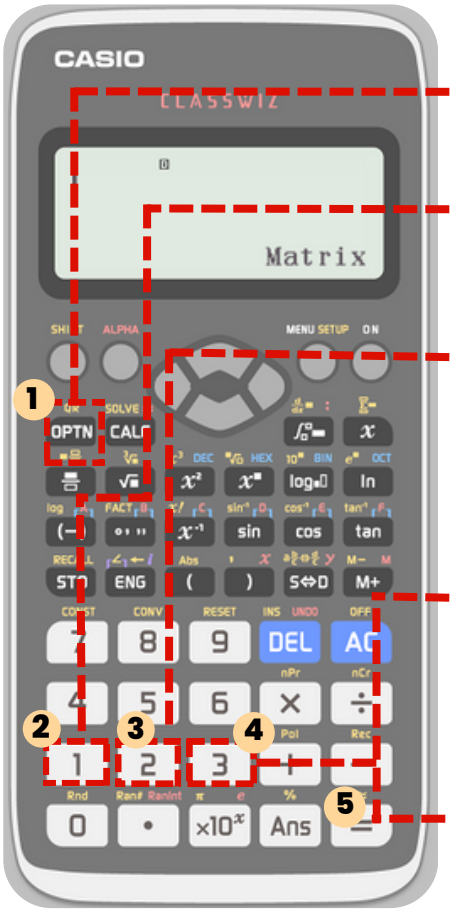
MATRICES

Define 3 x 3 Matrix

3 x 3 Matrix

$$\text{Mat B} = \begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix}$$

Make sure your calculator in Matrix Mode.
(refer Page 1)



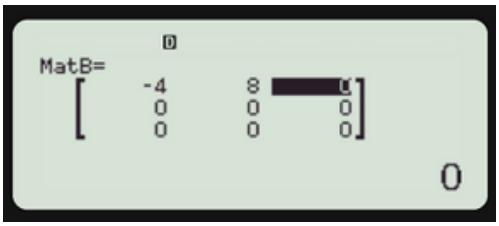
	Command	Display
1	Click 'OPTN'	1:Define Matrix 2:Edit Matrix 3:MatA 4:MatB 5:MatC 6:MatD
2	Click 1	
3	Click 2	Define Matrix 1:MatA 2:MatB 3:MatC 4:MatD
4	Insert number of rows Click no 3	MatA Number of Rows? Select 1~4
5	Insert number of columns Click no 3	MatA Number of Columns? Select 1~4

MATRICES

Define 3 x 3 Matrix

3 x 3 Matrix

$$\text{Mat B} = \begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix}$$

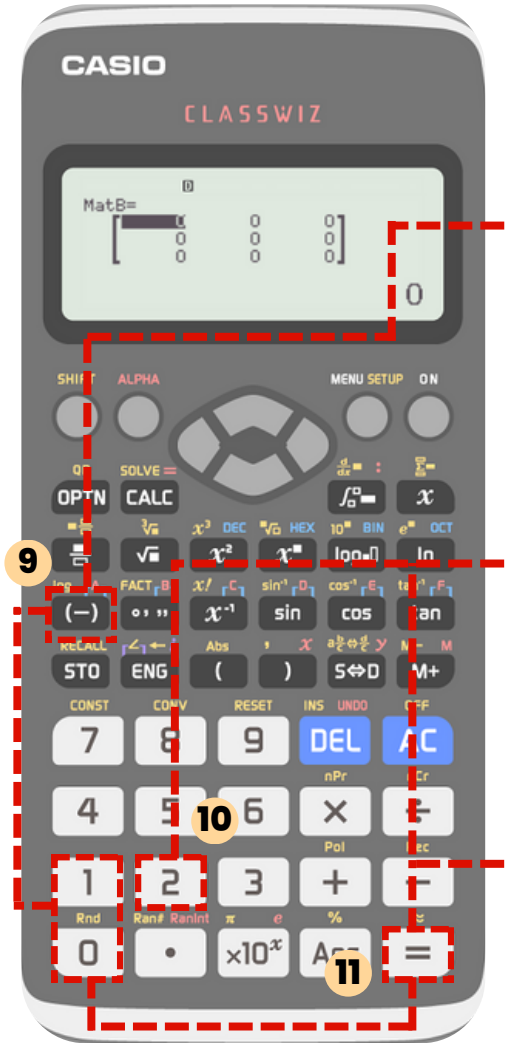
	Command	Display
6	**Insert the matrix value for b_{11}** Click -4 Click =	
7	**Insert the matrix value for b_{12}** Click 8 Click =	
8	**Insert the matrix value for b_{13}** Click 12 Click =	

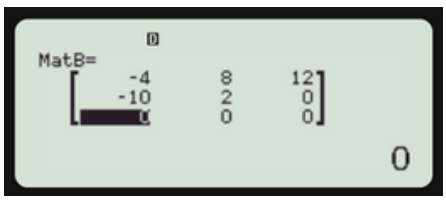
MATRICES

Define 3 x 3 Matrix

3 x 3 Matrix

$$\text{Mat B} = \begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix}$$



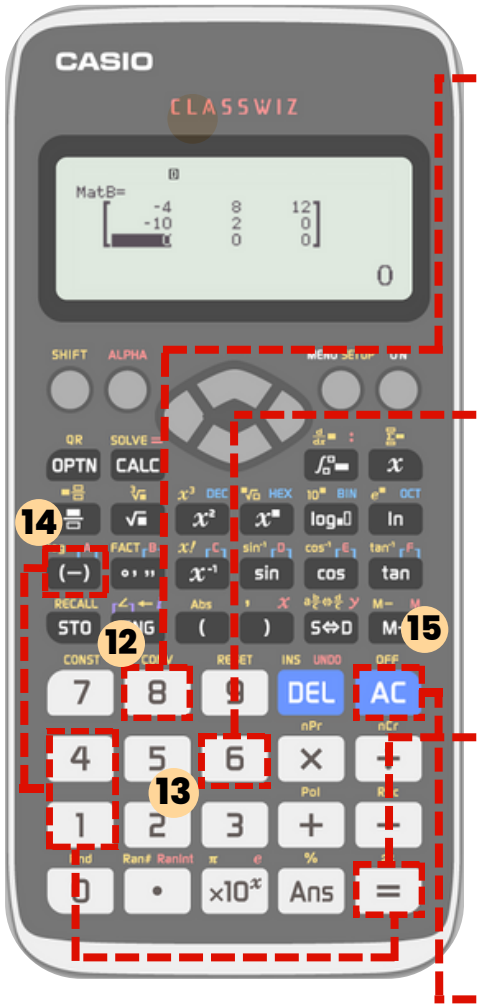
	Command	Display
9	**Insert the matrix value for b_{21}** Click -10 Click =	
10	**Insert the matrix value for b_{22}** Click 2 Click =	
11	**Insert the matrix value for b_{23}** Click 0 Click =	

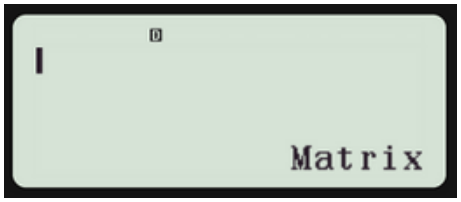
MATRICES

Define 3 x 3 Matrix

3 x 3 Matrix

Mat B = $\begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix}$



	Command	Display
12	**Insert the matrix value for b_{31}** Click 18 Click =	
13	**Insert the matrix value for b_{32}** Click 6 Click =	
14	**Insert the matrix value for b_{33}** Click -14 Click =	
15	Click AC	

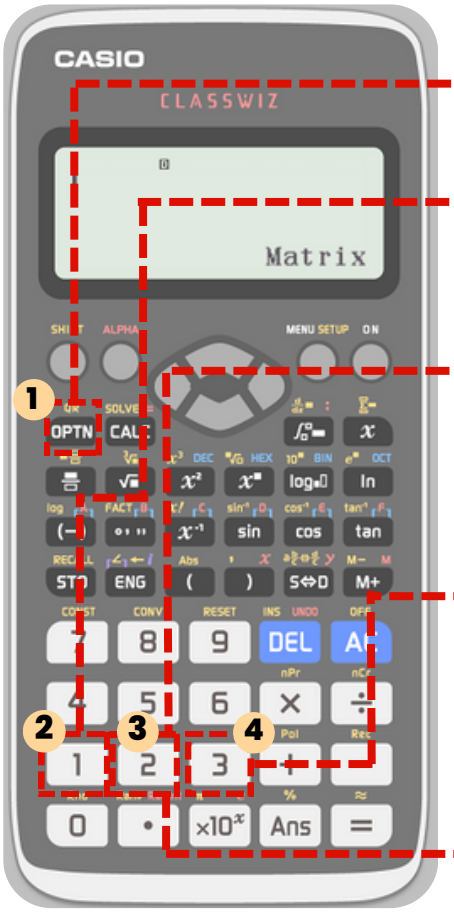
MATRICES

Define 3 x 2 Matrix

3 x 2 Matrix

$$\text{Mat C} = \begin{bmatrix} -2 & 4 \\ 6 & 3 \\ 2 & -1 \end{bmatrix}$$

Make sure your calculator in Matrix Mode.
(refer Page 1)



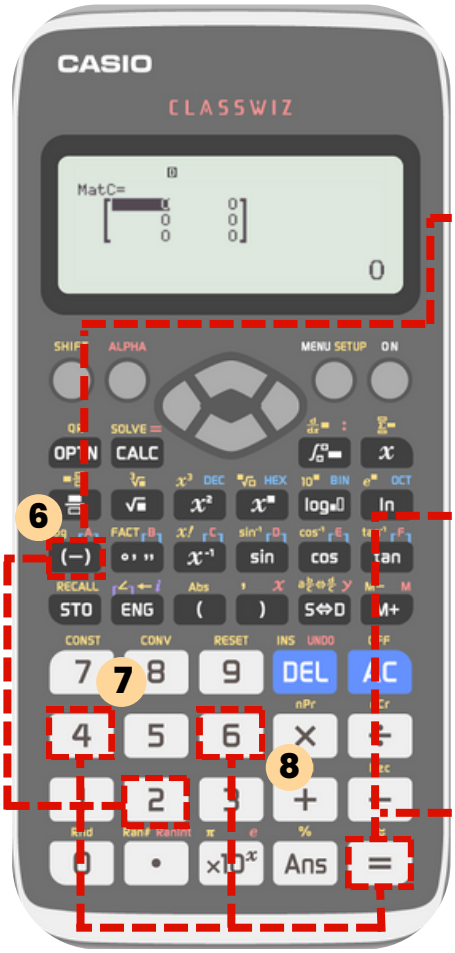
	Command	Display
1	Click 'OPTN'	1:Define Matrix 2:Edit Matrix 3:MatA 4:MatB 5:MatC 6:MatD
2	Click 1	
3	Click 3	Define Matrix 1:MatA 2:MatB 3:MatC 4:MatD
4	**Insert number of rows** Click no 3	MatA Number of Rows? Select 1~4
5	**Insert number of columns** Click no 2	MatA Number of Columns? Select 1~4

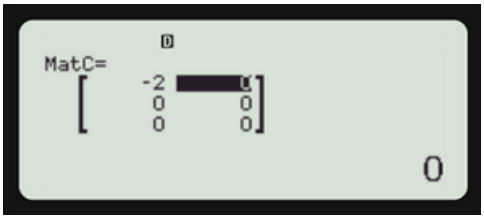
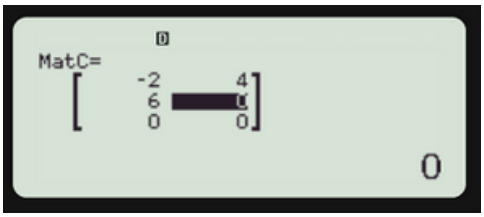
MATRICES

Define 3 x 2 Matrix

3 x 2 Matrix

$$\text{Mat C} = \begin{bmatrix} -2 & 4 \\ 6 & 3 \\ 2 & -1 \end{bmatrix}$$



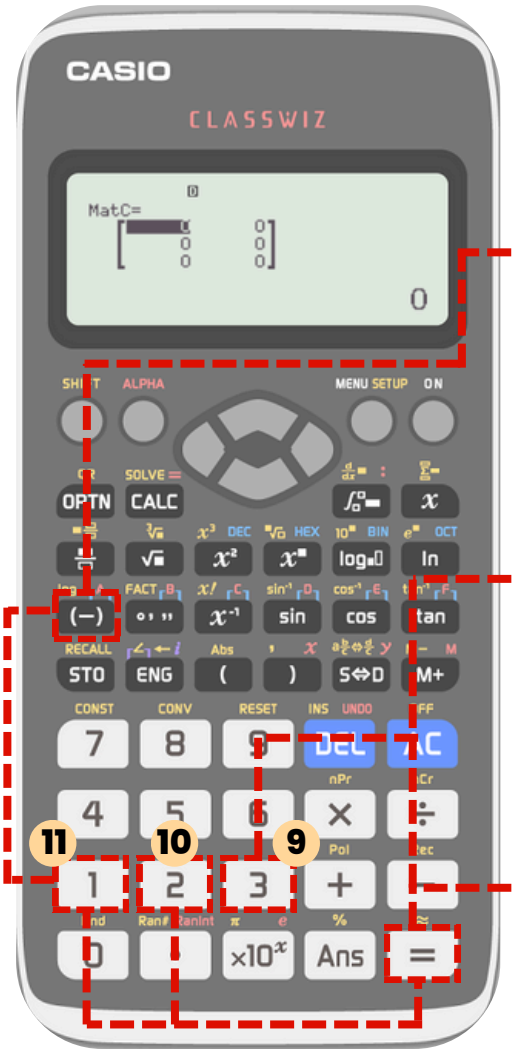
	Command	Display
6	**Insert the matrix value for c_{11}** Click -2 Click =	
7	**Insert the matrix value for c_{12}** Click 4 Click =	
8	**Insert the matrix value for c_{13}** Click 6 Click =	

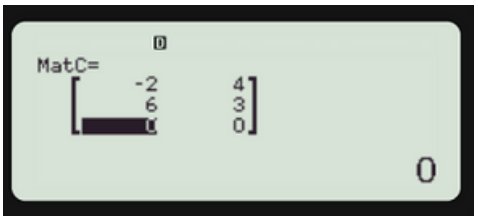
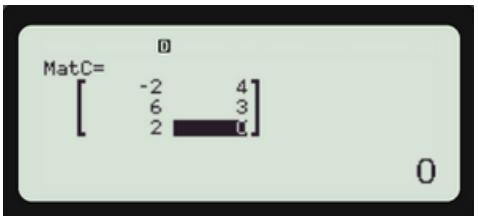
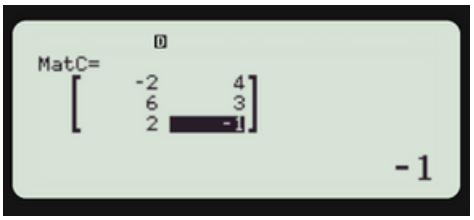
MATRICES

Define 3 x 2 Matrix

3 x 2 Matrix

$$\text{Mat C} = \begin{bmatrix} -2 & 4 \\ 6 & 3 \\ 2 & -1 \end{bmatrix}$$



	Command	Display
9	**Insert the matrix value for c_{21}** Click 3 Click =	
10	**Insert the matrix value for c_{22}** Click 2 Click =	
11	**Insert the matrix value for b_{23}** Click -1 Click =	

CALL MATRIX

MATRICES

Call Matrix

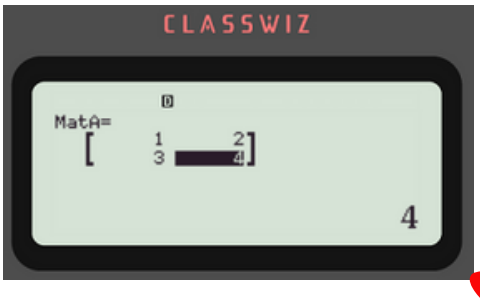
$$\text{Mat A} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

	Command	Display
1	Click 'OPTN'	1:Define Matrix 2:Edit Matrix 3:MatA 4:MatB 5:MatC 6:MatD
2	Click no 3	MatA

EDIT MATRIX

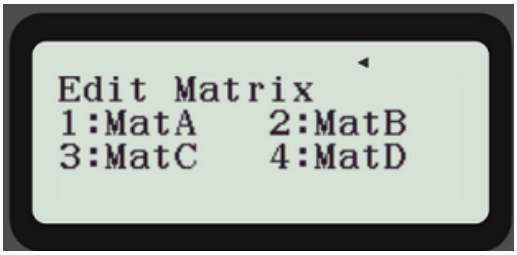
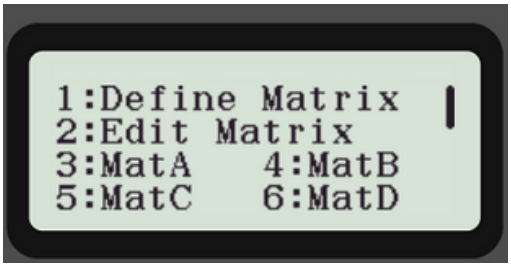
MATRICES

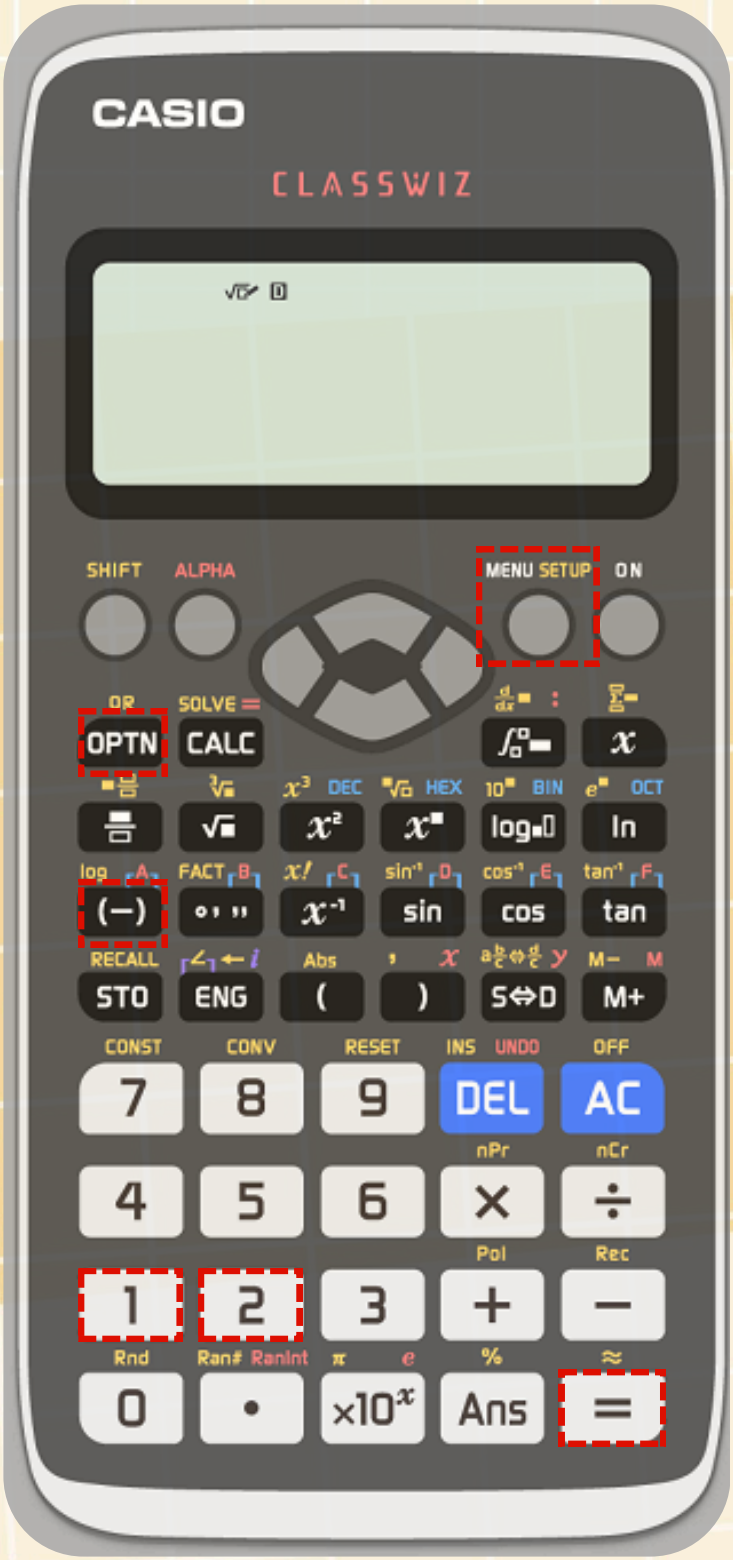
Edit 2 X 2 Matrix



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

Matrix A to **New Matrix A**

	Command	Display
1	Click 'OPTN' Click '2'	
2	Click '1'	
3	Insert the value of new Matrix A	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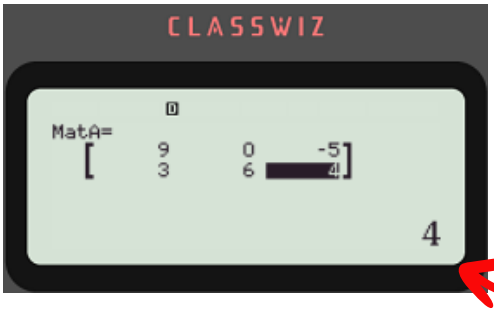
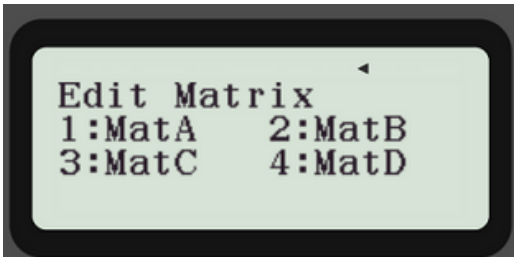
MATRICES

Edit 2 X 3 Matrix



$$\begin{bmatrix} 9 & 0 & -5 \\ 3 & 6 & 4 \end{bmatrix} \gg\gg \begin{bmatrix} 3 & -2 & 6 \\ -1 & 0 & 4 \end{bmatrix}$$

Matrix B **to** **New Matrix B**

	Command	Display
1	Click 'OPTN' Click '2'	
2	Click '1'	
3	Insert the value of new Matrix B	

IDENTITY MATRIX

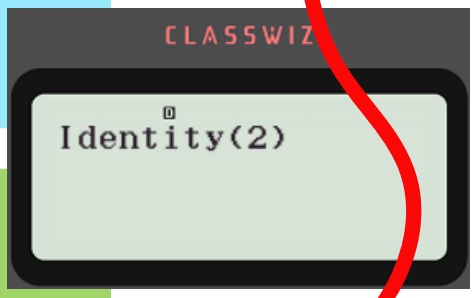
IDENTITY MATRIX , I

Call Identity Matrix

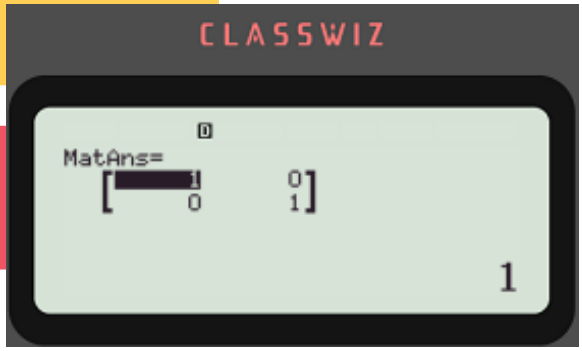
$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

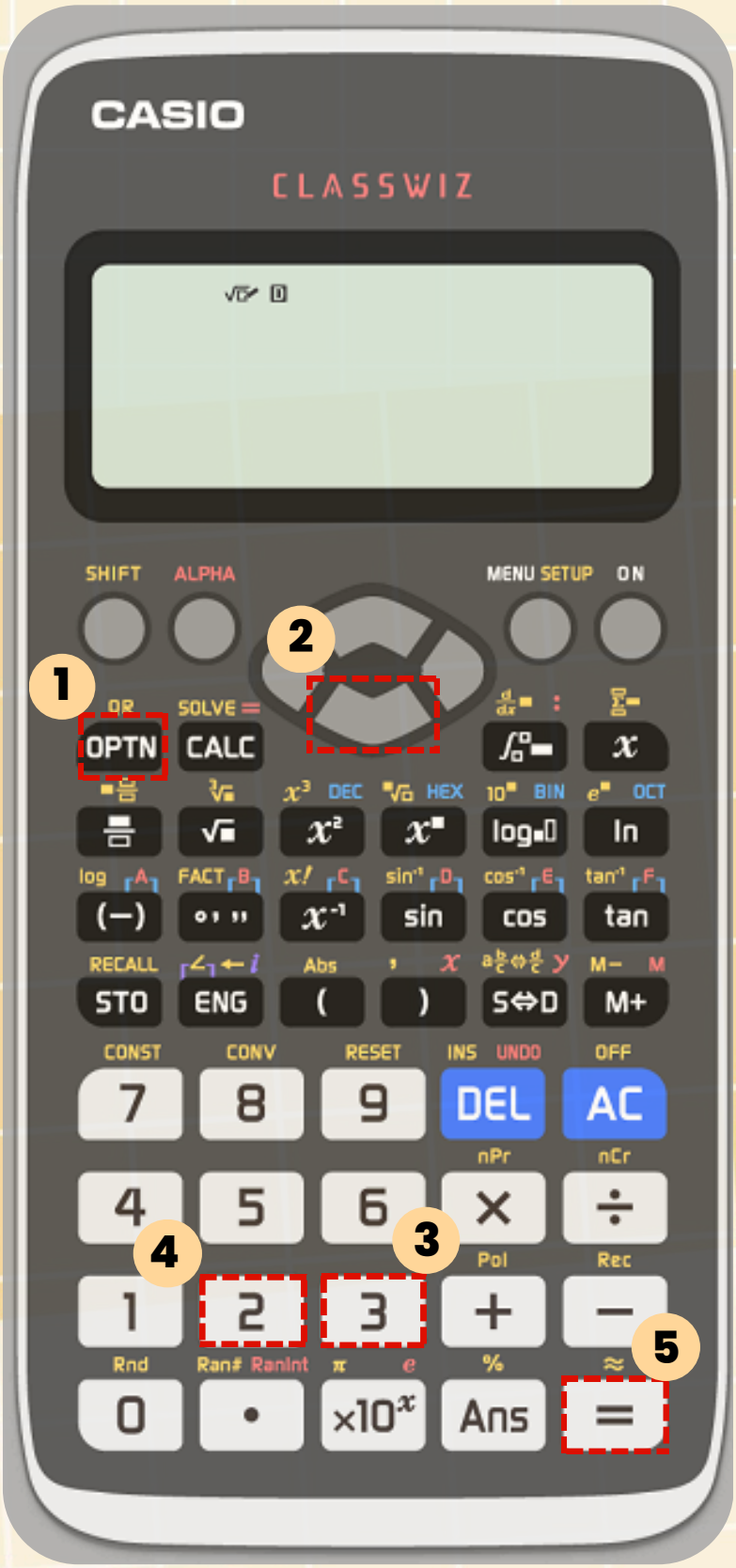
2 x 2 Identity Matrix

1. Make sure your calculator in Matrix Mode.
Refer Page 6
2. Click 'OPTN'
3. Click ▼



4. Click '4'
5. Click '2'
   Click '='




CASIO
CLASSWIZ
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CONST
CONV
RESET
INS
UNDO
OFF
DEL
AC
nPr
nCr
4
3
Pol
Rec
5
Rnd
Ran#
RanInt
Ans

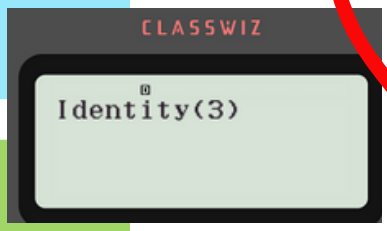
IDENTITY MATRIX , I

Call Identity Matrix

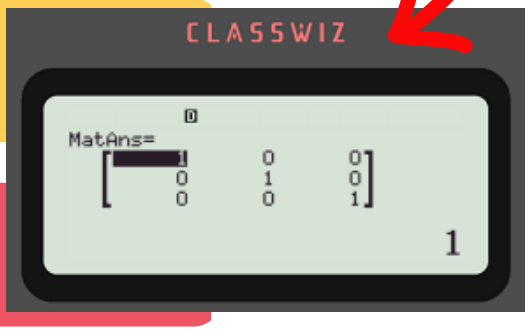
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

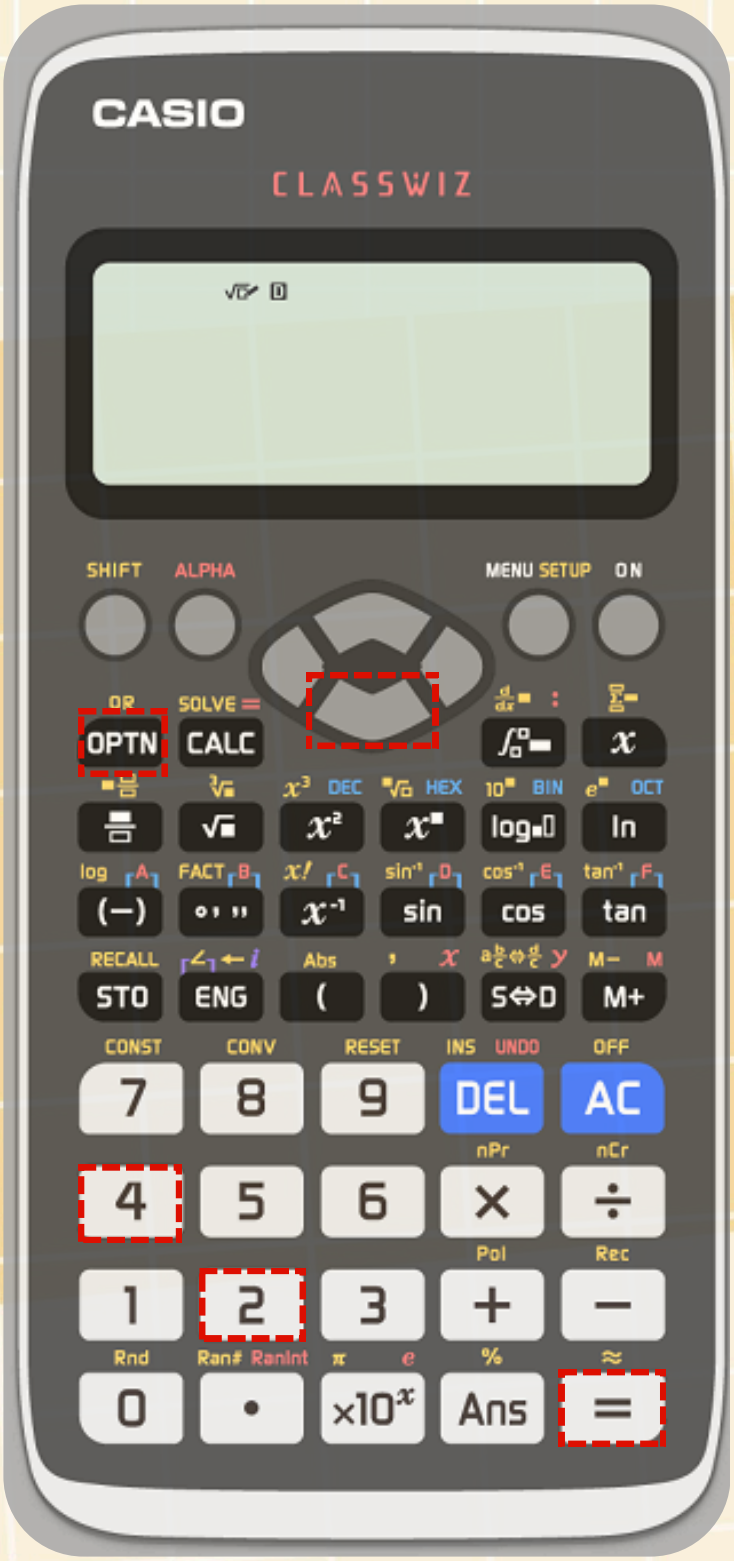
3 x 3 Identity Matrix

1. Make sure your calculator in Matrix Mode.
Refer Page 6
2. Click 'OPTN'



3. Click ▼
4. Click '4'
5. Click '3'
   Click '='




CASIO
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9
DEL
AC
4
5
6
1
2
3
0
Ans
=

IDENTITY MATRIX , I

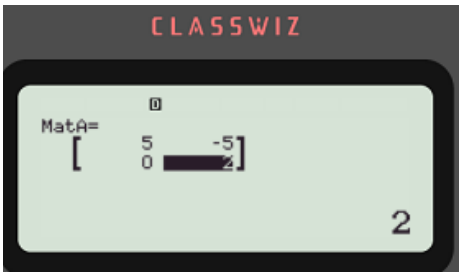
Solve Identity Matrix

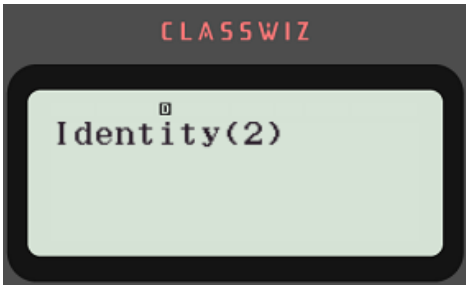
Example 1

Given A= $\begin{bmatrix} 5 & -5 \\ 0 & 2 \end{bmatrix}$, find IA

1 Make sure your calculator in Matrix Mode. (Refer Page 6)

Define Matrix A **2** (Refer Page 8)



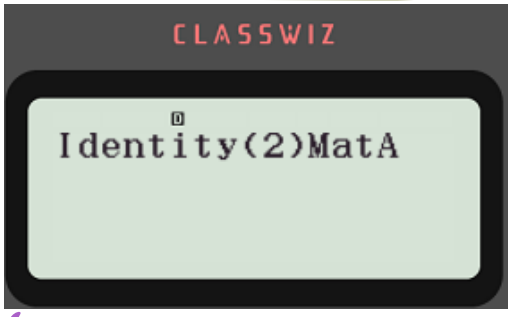


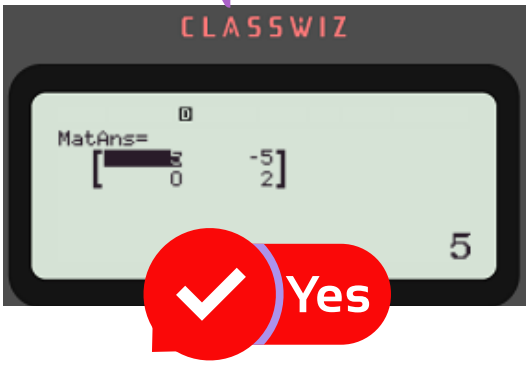
3 Call 2 x 2 Identity Matrix:

Click 'OPTN'
Click ▼
Click 4
Click 2
Click)

Call Matrix A (Refer Page 18) **4**

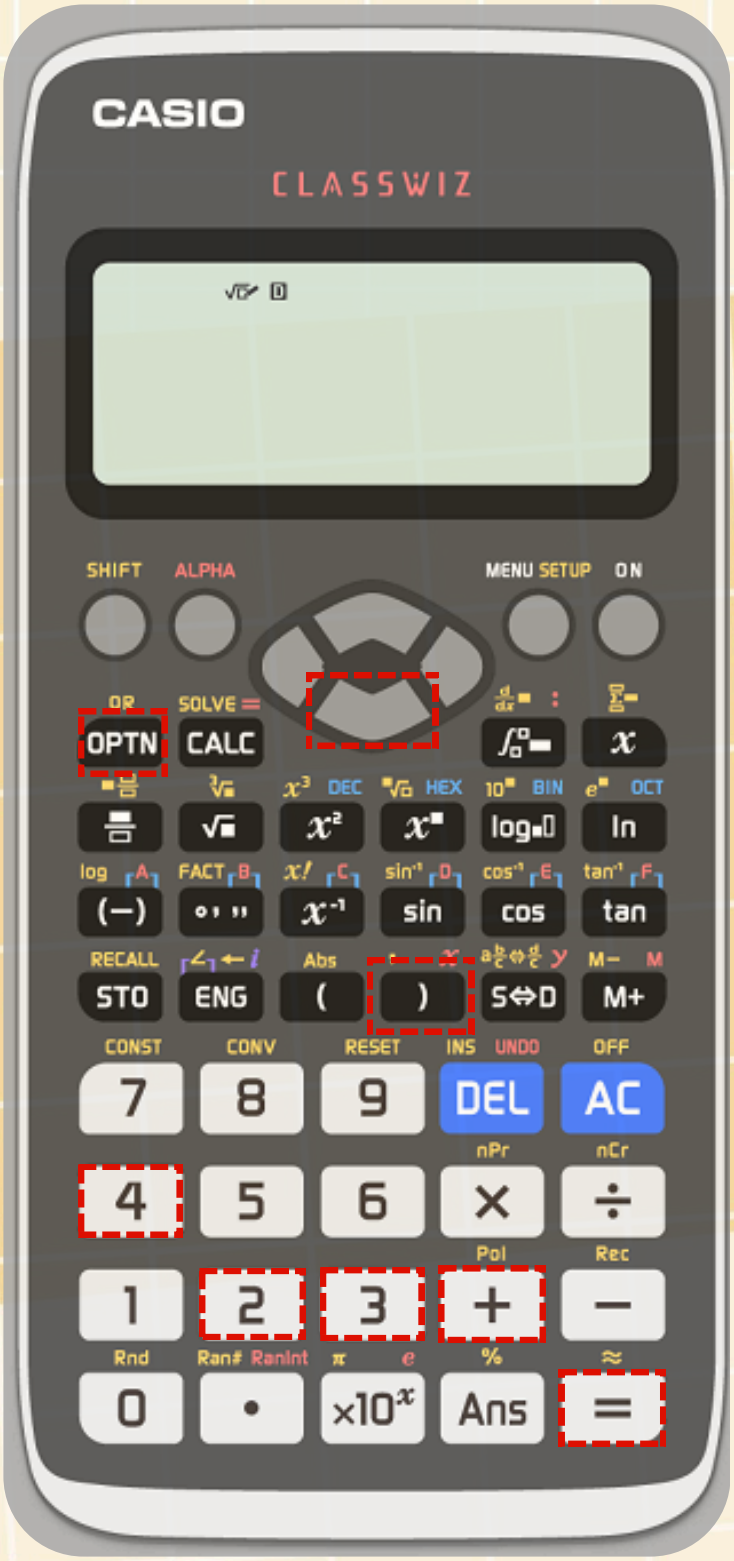
5 Click =





Yes

SCAN ME!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IDENTITY MATRIX , I

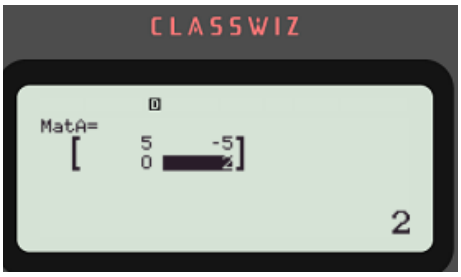
Solve Identity Matrix

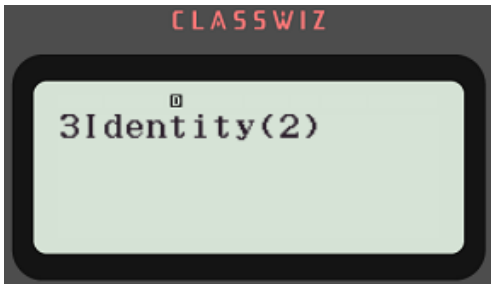
Example 2

Given A= $\begin{bmatrix} 5 & -5 \\ 0 & 2 \end{bmatrix}$, find $3I+2A$

1 Make sure your calculator in Matrix Mode. (Refer Page 6)

Define Matrix A **2**
(Refer Page 8)





3
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Click 'OPTN'
Click ▼
Click 4
Click 2
Click)

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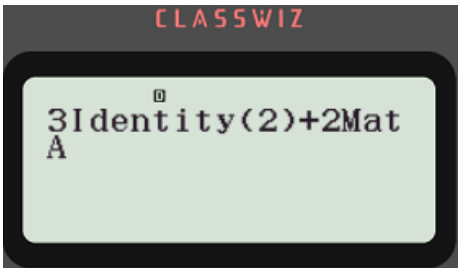
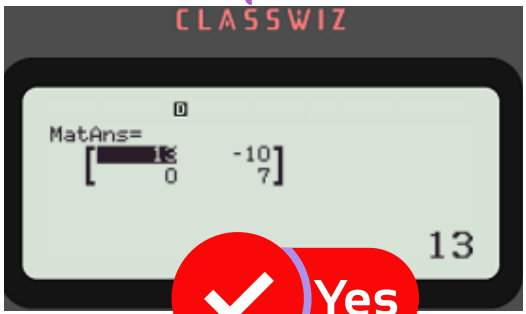
Click +
Click 2
Call Matrix A
(Refer Page 18)
Click =



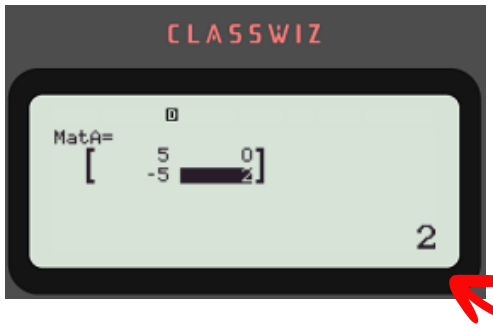


Yes

TRANSPOSE MATRIX

TRANSPOSE A MATRIX, A^T

Transpose a Matrix, A^T

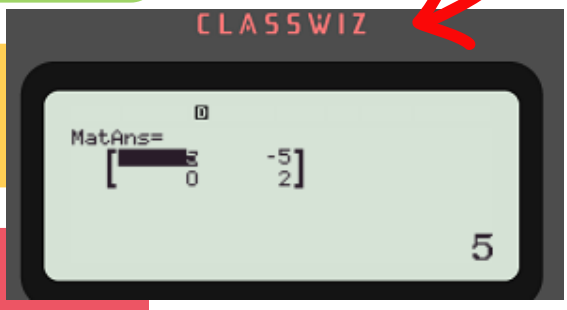


$$\begin{pmatrix} 5 & 0 \\ -5 & 2 \end{pmatrix} \gg\gg \begin{bmatrix} 5 & -5 \\ 0 & 2 \end{bmatrix}$$

Matrix A to **Matrix A^T**

1. Make sure your calculator in Matrix Mode.
   Refer Page 6
2. Define Matrix A
   Refer Page 8

3. Click 'OPTN'
   Click ▼
   Click 3
4. Call Matrix A
   Refer Page 18



5. Click =

SCAN ME!

OPERATION OF MATRIX

OPERATION OF MATRICES

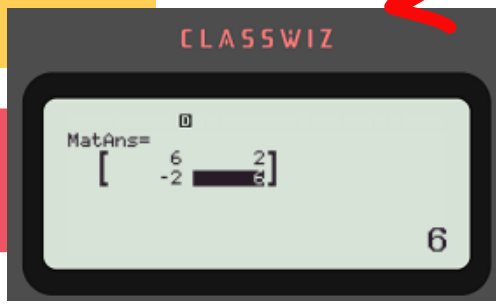
Additional of Matrix

2 x 2 Matrix

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

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6
2. Define Matrix A and Matrix B
Refer Page 8
3. Call Matrix A
Refer Page 18
4. Click '+'
5. Call Matrix B
Refer Page 18
Click =



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OPERATION OF MATRICES

Additional of Matrix

2 x 3 Matrix

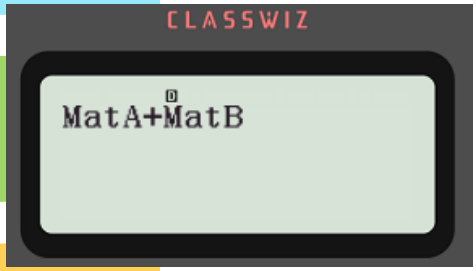
$$\begin{bmatrix} 9 & 0 & -5 \\ 3 & 6 & 4 \end{bmatrix} + \begin{bmatrix} 3 & -2 & 6 \\ -1 & 0 & 4 \end{bmatrix} = \begin{bmatrix} 12 & -2 & 1 \\ 2 & 6 & 8 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

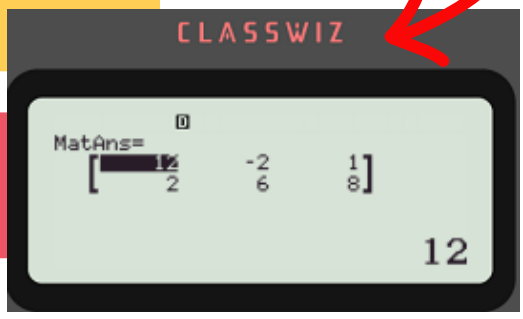
2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click '+'

5. Call Matrix B
Refer Page 18
Click =

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OPERATION OF MATRICES

Additional of Matrix

3 x 3 Matrix

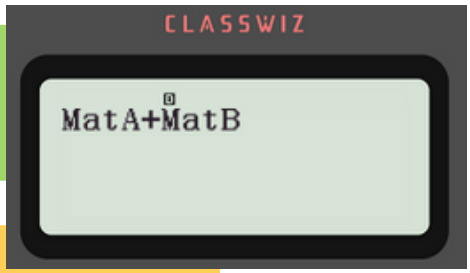
$$\begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix} + \begin{bmatrix} 5 & -2 & 7 \\ -2 & 4 & 2 \\ 7 & 2 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 6 & 19 \\ -12 & 6 & 2 \\ 25 & 8 & -8 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

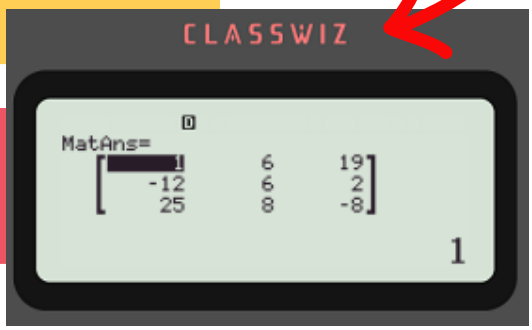
2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click '+'

5. Call Matrix B
Refer Page 18
Click =

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OPERATION OF MATRICES

Substraction of Matrix

2 x 2 Matrix

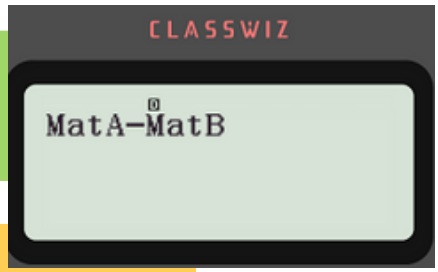
$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} - \begin{pmatrix} 5 & 0 \\ -5 & 2 \end{pmatrix} = \begin{pmatrix} -4 & 2 \\ 8 & 2 \end{pmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click '−'

5. Call Matrix B
Refer Page 18
Click =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OPERATION OF MATRICES

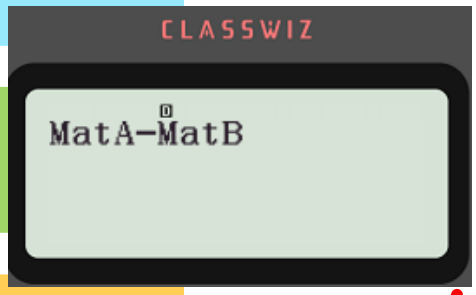
Substraction of Matrix

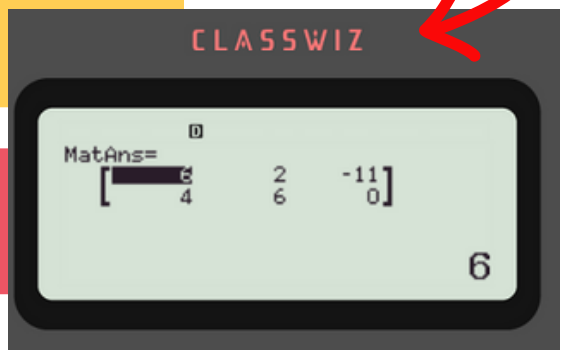
2 x 3 Matrix

$$\begin{bmatrix} 9 & 0 & -5 \\ 3 & 6 & 4 \end{bmatrix} - \begin{bmatrix} 3 & -2 & 6 \\ -1 & 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 2 & -11 \\ 4 & 6 & 0 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
   Refer Page 6
2. Define Matrix A and Matrix B
   Refer Page 8
3. Call Matrix A
   Refer Page 18
4. Click '−'
5. Call Matrix B
   Refer Page 18
   Click =



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OPERATION OF MATRICES

Substraction of Matrix

3 x 3 Matrix

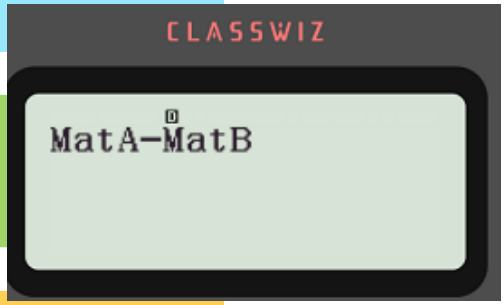
$$\begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix} - \begin{bmatrix} 5 & -2 & 7 \\ -2 & 4 & 2 \\ 7 & 2 & 6 \end{bmatrix} = \begin{bmatrix} -9 & 10 & 5 \\ -8 & -2 & -2 \\ 11 & 4 & -20 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

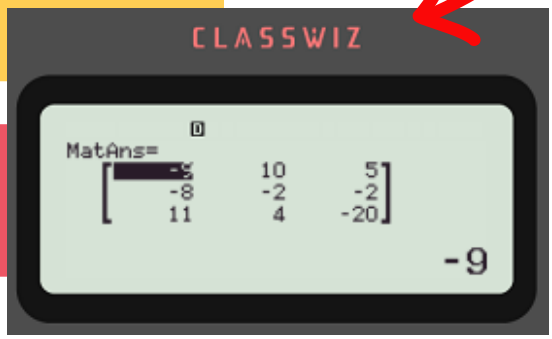
2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click '−'

5. Call Matrix B
Refer Page 18
Click =

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OPERATION OF MATRICES

Multiply by a Constant

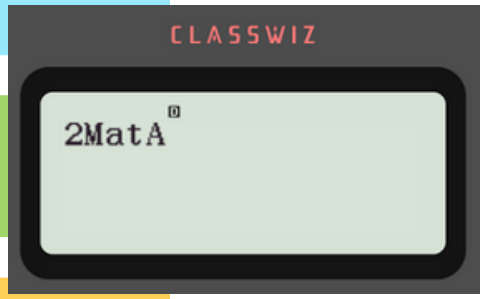
Example 1

$$2 \times 1 = 2$$

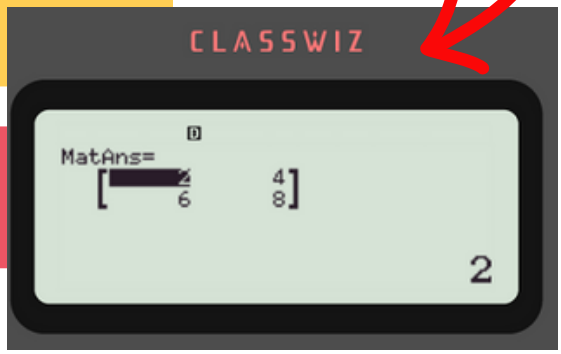
$$2\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix} = \begin{pmatrix}2 & 4\\ 6 & 8\end{pmatrix}$$

Matrix A **Matrix B**

1. Make sure your calculator in Matrix Mode.
   Refer Page 6
2. Define Matrix A
   Refer Page 8
3. Click 2
   Refer Page 18



4. Call Matrix A
   Refer Page 18
5. Click =

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OPERATION OF MATRICES

Multiply by a Constant

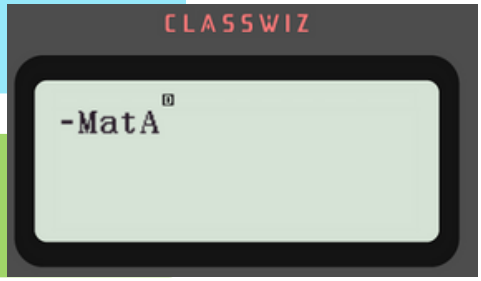
Example 2

$-(1) = -1$

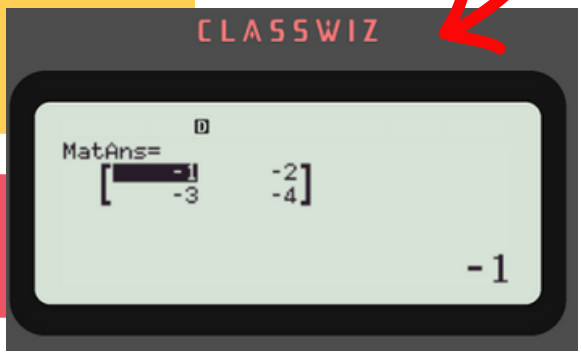
$$-\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix} = \begin{pmatrix}-1 & -2\\ -3 & -4\end{pmatrix}$$

Matrix A **Matrix B**

1. Make sure your calculator in Matrix Mode.
   Refer Page 6
2. Define Matrix A
   Refer Page 8



3. Click '−'
4. Call Matrix A
   Refer Page 18
5. Click =

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OPERATION OF MATRICES

Multiplication of Matrix

Example 1

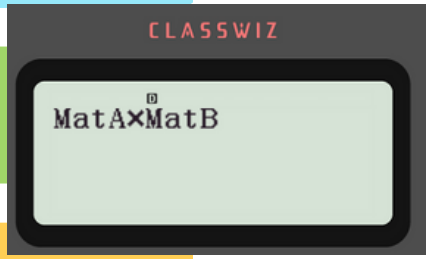
$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} 5 & 0 \\ -5 & 2 \end{pmatrix} = \begin{pmatrix} -5 & 4 \\ -5 & 8 \end{pmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

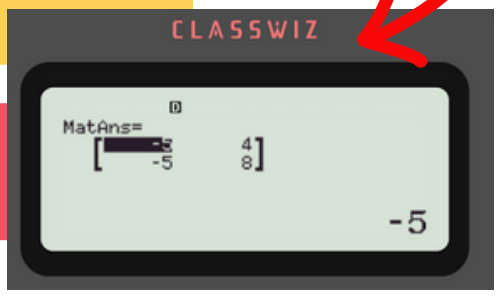
2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click 'x'

5. Call Matrix B
Refer Page 18
Click =

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OPERATION OF MATRICES

Multiplication of Matrix

Example 3

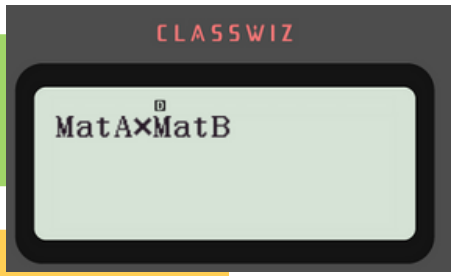
$$\begin{bmatrix} -2 & 4 \\ 6 & 3 \\ 2 & -1 \end{bmatrix} \times \begin{bmatrix} 6 & 2 \\ -2 & 6 \end{bmatrix} = \begin{bmatrix} -20 & 20 \\ 30 & 30 \\ 14 & -2 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
Refer Page 6

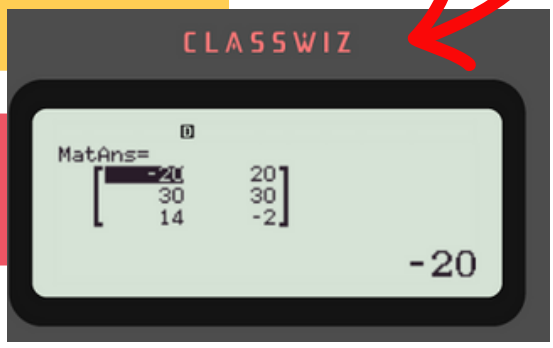
2. Define Matrix A and Matrix B
Refer Page 8

3. Call Matrix A
Refer Page 18



4. Click 'X'

5. Call Matrix B
Refer Page 18
Click =

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OPERATION OF MATRICES

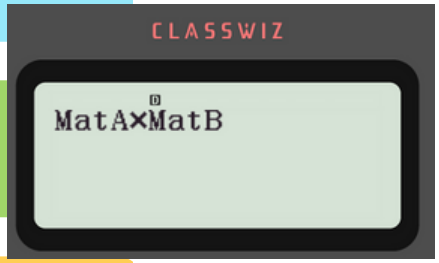
Multiplication of Matrix

Example 2

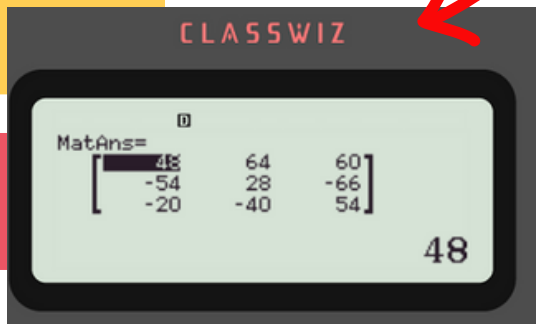
$$\begin{bmatrix} -4 & 8 & 12 \\ -10 & 2 & 0 \\ 18 & 6 & -14 \end{bmatrix} \times \begin{bmatrix} 5 & -2 & 7 \\ -2 & 4 & 2 \\ 7 & 2 & 6 \end{bmatrix} = \begin{bmatrix} 48 & 64 & 60 \\ -54 & 28 & -66 \\ -20 & -40 & 54 \end{bmatrix}$$

Matrix A **Matrix B** **Matrix C**

1. Make sure your calculator in Matrix Mode.
   Refer Page 6
2. Define Matrix A and Matrix B
   Refer Page 8
3. Call Matrix A
   Refer Page 18



4. Click 'X'
5. Call Matrix B
   Refer Page 18
   Click =



SCAN ME!

DETERMINANT OF MATRIX

DETERMINANT OF MATRIX, $|A|$

Calculating the Determinant of Matrix A

2 x 2 Matrix

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Matrix A

Determinant of Matrix A , $|A|$ = -2

1. Make sure your calculator in Matrix Mode.
Refer Page 6
2. Define Matrix A
Refer Page 8
3. Click 'OPTN'
Click ▼
Click 2
4. Call Matrix A
Refer Page 18
5. Click =

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DETERMINANT OF MATRIX, $|A|$

Calculating the Determinant of Matrix A

3 x 3 Matrix

$$\begin{bmatrix} 5 & -2 & 7 \\ -2 & 4 & 2 \\ 7 & 2 & 6 \end{bmatrix}$$

Matrix A

Determinant of Matrix A , $|A|$ = -176

1. Make sure your calculator in Matrix Mode.
Refer Page 6
2. Define Matrix A
Refer Page 8
3. Click 'OPTN'
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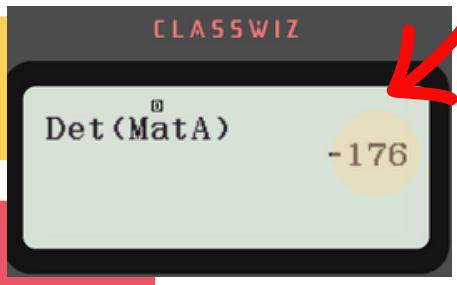
4. Call Matrix A
Refer Page 18
5. Click =



SCAN ME!

BACK

SIMULTANEOUS LINEAR EQUATION

SIMULTANEOUS LINEAR EQUATION

Solve Simultaneous Linear Equation

2 x 2 Matrix

$$3x + 4y = 18$$
$$x + 7y = 23$$

Convert equation to matrix form

$$\begin{bmatrix} 3 & 4 \\ 1 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 18 \\ 23 \end{bmatrix}$$

A X B

1 Click ON
Click MENU
Click '(—)'

Click 1
Click 2 **2**

3 Insert Matrix A and value of B

$$\begin{bmatrix} 3 & 4 \\ 1 & 7 \end{bmatrix} \quad \begin{bmatrix} 18 \\ 23 \end{bmatrix}$$

A B

Click = to get the value of x **4**

5 Click = to get the value of y

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SIMULTANEOUS LINEAR EQUATION

Solve Simultaneous Linear Equation

3 x 3 Matrix

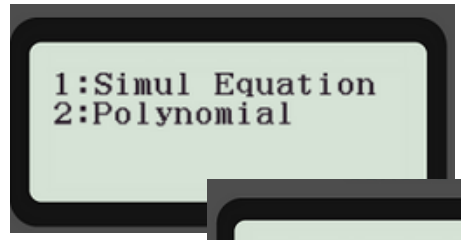
$$2x - 4y + 3z = -3$$
$$x + 2y - 5z = 9$$
$$-3x - y + 2z = -9$$

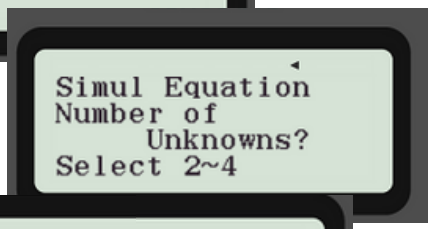
Convert equation to matrix form

$$\underbrace{\begin{bmatrix} 2 & -4 & 3 \\ 1 & 2 & -5 \\ -3 & -1 & 2 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x \\ y \\ z \end{bmatrix}}_{X} = \underbrace{\begin{bmatrix} -3 \\ 9 \\ -9 \end{bmatrix}}_{B}$$

1 Click ON
Click MENU
Click '(—)'

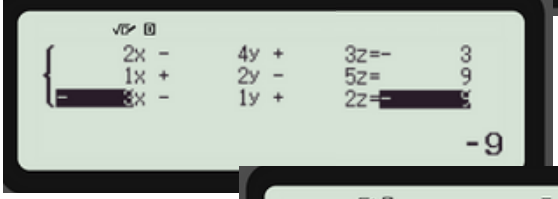
Click 1
Click 3 **2**

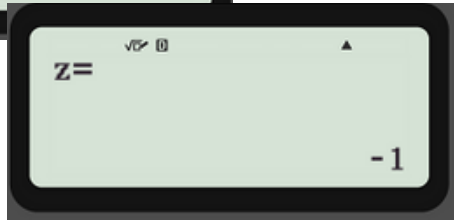




3 Insert Matrix A and value of B

$$\underbrace{\begin{bmatrix} 2 & -4 & 3 \\ 1 & 2 & -5 \\ -3 & -1 & 2 \end{bmatrix}}_{A} \quad \underbrace{\begin{bmatrix} -3 \\ 9 \\ -9 \end{bmatrix}}_{B}$$





Click = to get the value of x **4**

5 Click = to get the value of y

Click = to get the value of z **6**

BACK

CRAMER METHOD

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

$$3x + 4y = 18$$
$$x + 7y = 23$$

Convert equation to matrix form

$$\begin{bmatrix} 3 & 4 \\ 1 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 18 \\ 23 \end{bmatrix}$$

A X B

Find Determinant of Matrix A

Manual Calculation

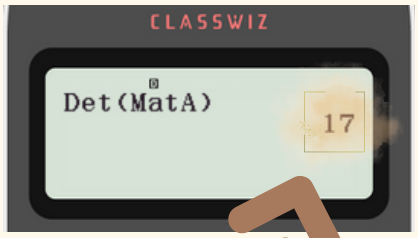
$$A = \begin{bmatrix} 3 & 4 \\ 1 & 7 \end{bmatrix}$$

$$|A| = (3 \times 7) - (1 \times 4)$$
$$= 21 - 4$$
$$= 17$$

Using Calculator

Determine determinant of Matrix A

CLICK HERE!



Same answer

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Find Determinant of Matrix A_1

Manual Calculation

$$A_1 = \begin{bmatrix} 18 & 4 \\ 23 & 7 \end{bmatrix} \quad B$$

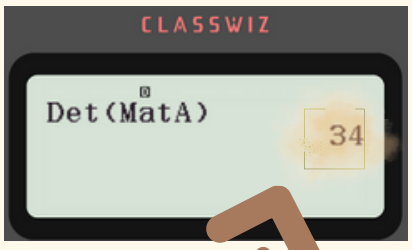
$$|A_1| = (18 \times 7) - (23 \times 4)$$

$$= 126 - 92$$

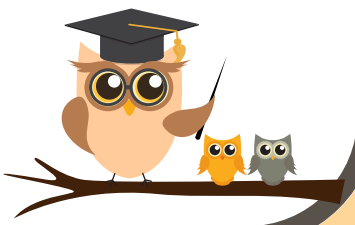
$$= 34$$

Using Calculator

Determine determinant of Matrix A_1 . Refer page 56



Same answer



CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Find Determinant of Matrix A_2

Manual Calculation

$$A_2 = \begin{bmatrix} 3 & 18 \\ 1 & 23 \end{bmatrix}$$ (B)

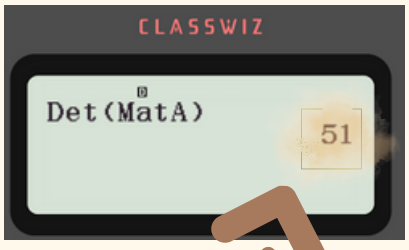
$$|A_2| = (3 \times 23) - (18 \times 1)$$

$$= 69 - 18$$

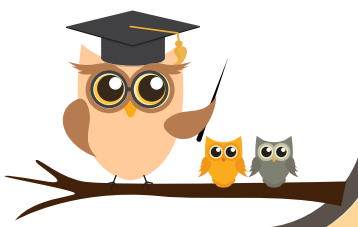
$$= 51$$

Using Calculator

Determine determinant of Matrix A_2 . Refer page 56



Same answer



CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Calculating the value of x and y

Manual Calculation

$$x = \frac{|A_1|}{|A|} = \frac{34}{17} = 2$$

$$y = \frac{|A_2|}{|A|} = \frac{51}{17} = 3$$

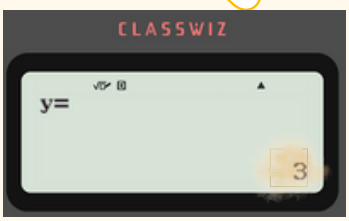
Same answer

Same answer

Using Calculator

Determine the value of x and y

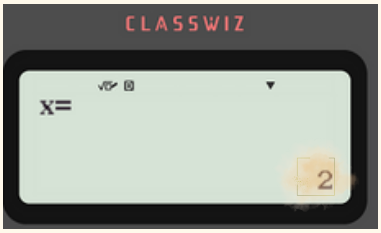
CLICK HERE!



Using Calculator

Determine the value of x and y

CLICK HERE!



CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

$$2x - 4y + 3z = -3$$
$$x + 2y - 5z = 9$$
$$-3x - y + 2z = -9$$

Convert equation to matrix form

$$\begin{bmatrix} 2 & -4 & 3 \\ 1 & 2 & -5 \\ -3 & -1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -3 \\ 9 \\ -9 \end{bmatrix}$$

A **X** **B**

Find Determinant of Matrix A

Manual Calculation

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

$$|A| = (8 - 60 - 3) - (-18 + 10 - 8)$$
$$= -55 + 16$$
$$= -39$$

Using Calculator

Determine determinant of Matrix A

CLICK HERE!

Same answer

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Find Determinant of Matrix A_1

Manual Calculation

$$A_1 = \begin{bmatrix} -3 & -4 & 3 \\ 9 & 2 & -5 \\ -9 & -1 & 2 \end{bmatrix} \quad B$$

$$|A_1| = (-12 - 180 - 27) - (-54 - 15 - 72)$$
$$= -219 + 141$$
$$= -78$$

Using Calculator

Determine determinant of Matrix A_1. Refer page 58

Same answer

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Find Determinant of Matrix A_2

Manual Calculation

$$A_2 = \begin{bmatrix} 2 & -3 & 3 \\ 1 & 9 & -5 \\ -3 & -9 & 2 \end{bmatrix}$$

B

$$|A_2| = (36 - 45 - 27) - (-81 + 90 - 6)$$

$$= -36 - 3$$

$$= -39$$

Using Calculator

Determine determinant of Matrix A_2. Refer page 58

Same answer

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Find Determinant of Matrix A_3

Manual Calculation

$$A_3 = \begin{bmatrix} 2 & -4 & -3 \\ 1 & 2 & 9 \\ -3 & -1 & -9 \end{bmatrix}$$

B

$$|A_3| = (-36 + 108 + 3) - (18 - 18 + 36)$$

$$= 75 - 36$$

$$= 39$$

Using Calculator

Determine determinant of Matrix A_3 . Refer page 58

Same answer

CRAMER METHOD

Solving Simultaneous Linear Equation Using Cramer Rules

Calculating the value of x, y and z

Manual Calculation

$$x = \frac{|A_1|}{|A|} = \frac{-78}{-39} = 2$$

$$y = \frac{|A_2|}{|A|} = \frac{-39}{-39} = 1$$

$$z = \frac{|A_3|}{|A|} = \frac{39}{-39} = -1$$

Same answer

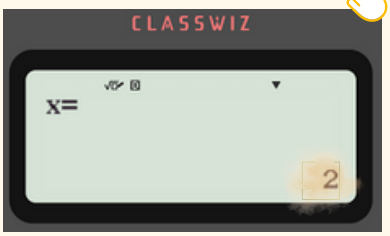
Same answer

Same answer

Using Calculator

Determine the value of x

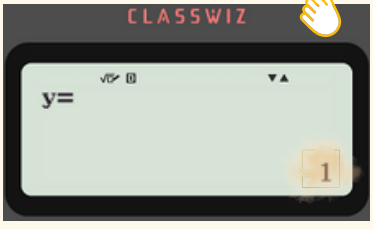
CLICK HERE!



Using Calculator

Determine the value of y

CLICK HERE!



Using Calculator

Determine the value of z

CLICK HERE!

INVERSE METHOD

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

$$2x - 4y + 3z = -3$$
$$x + 2y - 5z = 9$$
$$-3x - y + 2z = -9$$

Convert equation to matrix form

$$\begin{bmatrix} 2 & -4 & 3 \\ 1 & 2 & -5 \\ -3 & -1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -3 \\ 9 \\ -9 \end{bmatrix}$$

A **X** **B**

Find Determinant of Matrix A

Manual Calculation

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

$$|A| = (8 - 60 - 3) - (-18 + 10 - 8)$$
$$= -55 + 16$$
$$= -39$$

Using Calculator

Determine determinant of Matrix A. Refer page 58

Same answer

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find MINOR for Matrix A

Manual Calculation

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

$$\text{Minor A}=\begin{bmatrix} \begin{pmatrix} 2 & -5 \\ -1 & 2 \end{pmatrix} & \begin{pmatrix} 1 & -5 \\ -3 & 2 \end{pmatrix} & \begin{pmatrix} 1 & 2 \\ -3 & -1 \end{pmatrix} \\ \begin{pmatrix} -4 & 3 \\ -1 & 2 \end{pmatrix} & \begin{pmatrix} 2 & 3 \\ -3 & 2 \end{pmatrix} & \begin{pmatrix} 2 & -4 \\ -3 & -1 \end{pmatrix} \\ \begin{pmatrix} -4 & 3 \\ 2 & -5 \end{pmatrix} & \begin{pmatrix} 2 & 3 \\ 1 & -5 \end{pmatrix} & \begin{pmatrix} 2 & -4 \\ 1 & 2 \end{pmatrix} \end{bmatrix}$$

$$=\begin{bmatrix} -1 & -13 & 5 \\ -5 & 13 & -14 \\ 14 & -13 & 8 \end{bmatrix}$$

MINOR can **ONLY** be determined using manual calculation

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find COFACTOR for Matrix A

Manual Calculation

Cofactor A

$$= (\text{MINOR A}) \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$= \begin{bmatrix} -1 & -13 & 5 \\ -5 & 13 & -14 \\ 14 & -13 & 8 \end{bmatrix} \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$= \begin{bmatrix} -1 & 13 & 5 \\ 5 & 13 & 14 \\ 14 & 13 & 8 \end{bmatrix}$$

COFACTOR can **ONLY** be determined using manual calculation

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find ADJOIN for Matrix A

Manual Calculation

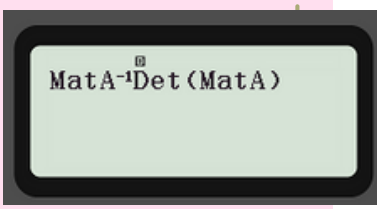
$$\text{Adjoin A} = (\text{Cofactor A})^T$$

$$= \begin{bmatrix} -1 & 13 & 5 \\ 5 & 13 & 14 \\ 14 & 13 & 8 \end{bmatrix}^T$$

$$= \begin{bmatrix} -1 & 5 & 14 \\ 13 & 13 & 13 \\ 5 & 14 & 8 \end{bmatrix}$$

Using Calculator

- Click OPTN
- Click 3
- Click x^{-1}
- Click OPTN
- Click ▼
- Click 2
- Click OPTN
- Click 3
- Click '='



Same answer

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find INVERSE MATRIX

Manual Calculation

$$\text{Inverse Matrix} = \frac{1}{|A|}(\text{Adjoin A})$$

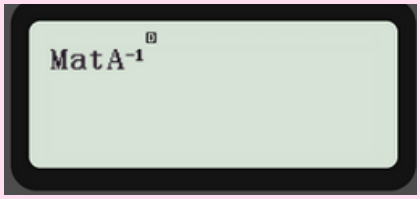
$$= \frac{1}{-39}\begin{bmatrix} -1 & 5 & 14 \\ 13 & 13 & 13 \\ 5 & 14 & 8 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{1}{-39} & \frac{5}{-39} & \frac{14}{-39} \\ \frac{13}{-39} & \frac{13}{-39} & \frac{13}{-39} \\ \frac{5}{-39} & \frac{14}{-39} & \frac{8}{-39} \end{bmatrix}$$

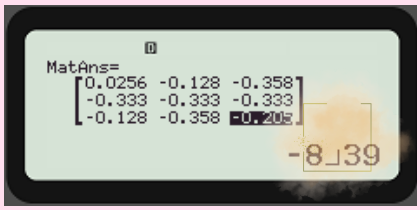
Using Calculator

- Click OPTN
- Click 3

- Click x^{-1}



- Click '='



Same answer

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find value of x, y and z in Matrix X

TECHNIQUE 1

Manual Calculation

$$X = \frac{1}{|A|}(\text{Adjoin A}) \times B$$

$$X = \frac{1}{-39}\begin{bmatrix}-1 & 5 & 14\\ 13 & 13 & 13\\ 5 & 14 & 8\end{bmatrix}\begin{bmatrix}-3\\ 9\\ -9\end{bmatrix}$$

$$X = \frac{1}{-39}\begin{bmatrix}-78\\ -39\\ 39\end{bmatrix}$$

$$X = \begin{bmatrix}\frac{-78}{-39}\\ \frac{-39}{-39}\\ \frac{39}{-39}\end{bmatrix}$$

$$\begin{bmatrix}x\\ y\\ z\end{bmatrix} = \begin{bmatrix}2\\ 1\\ -1\end{bmatrix}$$

Using Calculator

- Click 1
- Click
- Click -39 (Det A)
- Click 'x'
- Click OPTN
- Click
- Click 1
- Click 'x'
- Click OPTN
- Click 4

Same answer

INVERSE METHOD

Solving Simultaneous Linear Equation Using Inverse Method

Find value of *x*, *y* and *z* in Matrix X

TECHNIQUE 2

Manual Calculation

$$X = \frac{1}{|A|}(\text{Adjoin A}) \times B$$

$$X = \frac{1}{-39}\begin{bmatrix} -1 & 5 & 14 \\ 13 & 13 & 13 \\ 5 & 14 & 8 \end{bmatrix}\begin{bmatrix} -3 \\ 9 \\ -9 \end{bmatrix}$$

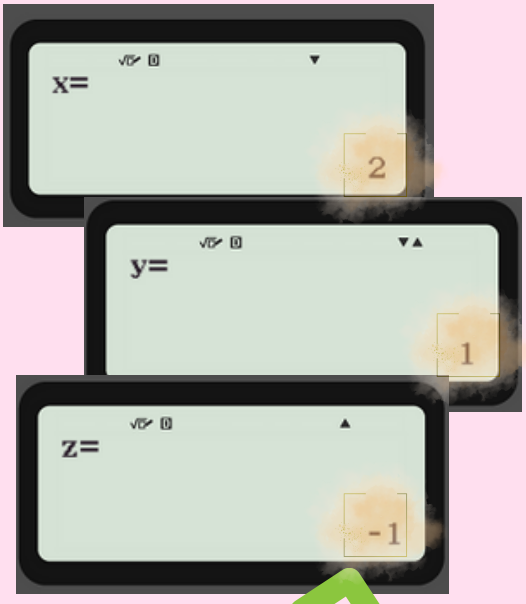
$$X = \frac{1}{-39}\begin{bmatrix} -78 \\ -39 \\ 39 \end{bmatrix}$$

$$X = \begin{bmatrix} \frac{-78}{-39} \\ \frac{-39}{-39} \\ \frac{39}{-39} \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}$$

Using Calculator

Refer Page 62



Same answer

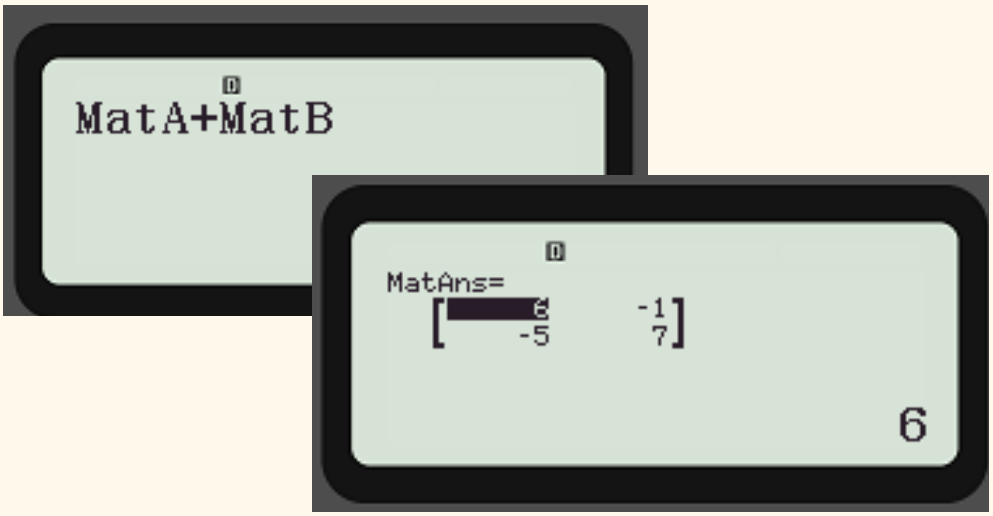
EXERCISE

Let's Try:

If given $A = \begin{bmatrix} 3 & -2 \\ -5 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 0 & -2 \end{bmatrix}$

Find A+B

Answer:

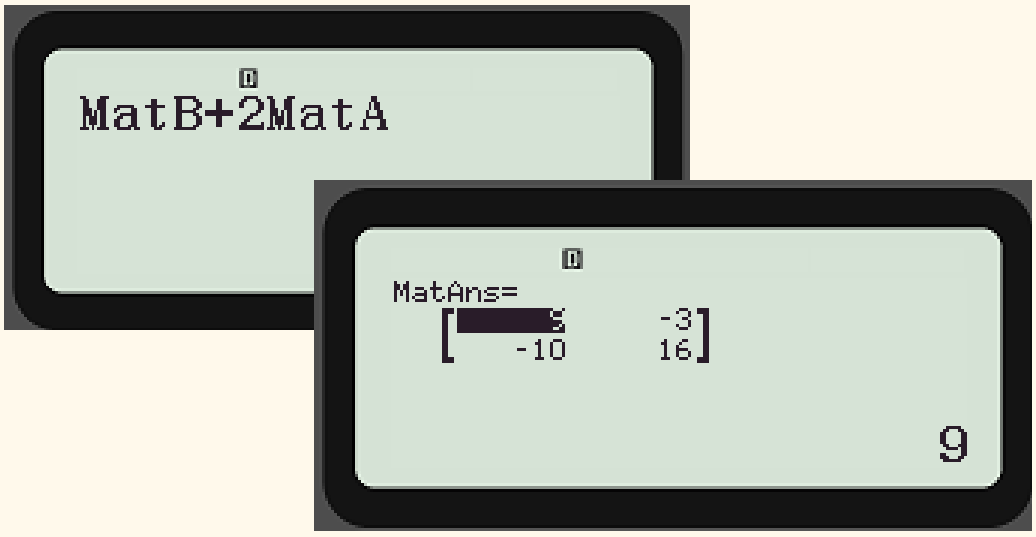


Let's Try:

If given $A = \begin{bmatrix} 3 & -2 \\ -5 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 0 & -2 \end{bmatrix}$

Find B + 2A

Answer:

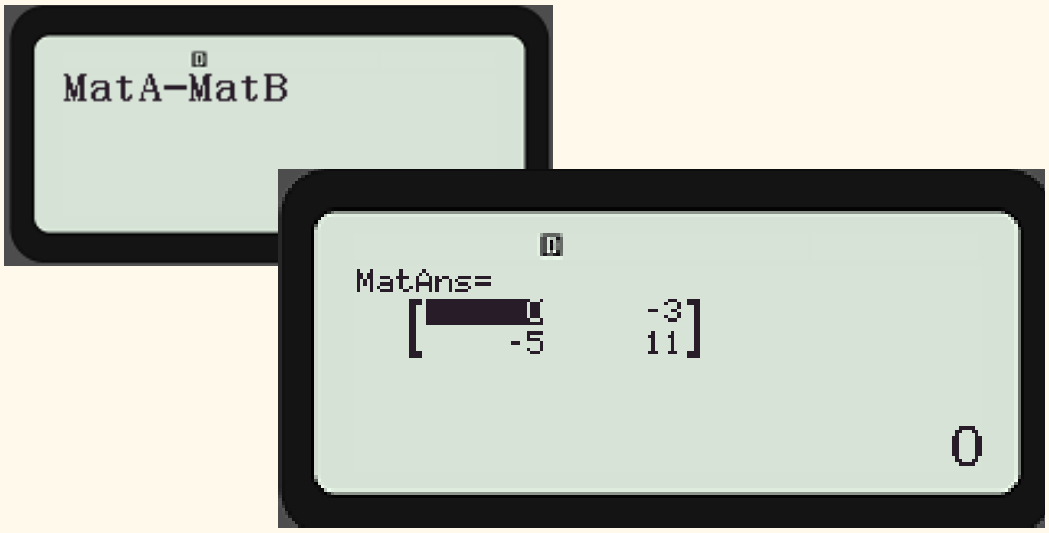


Let's Try:

If given $A = \begin{bmatrix} 3 & -2 \\ -5 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 0 & -2 \end{bmatrix}$

Find A – B

Answer:

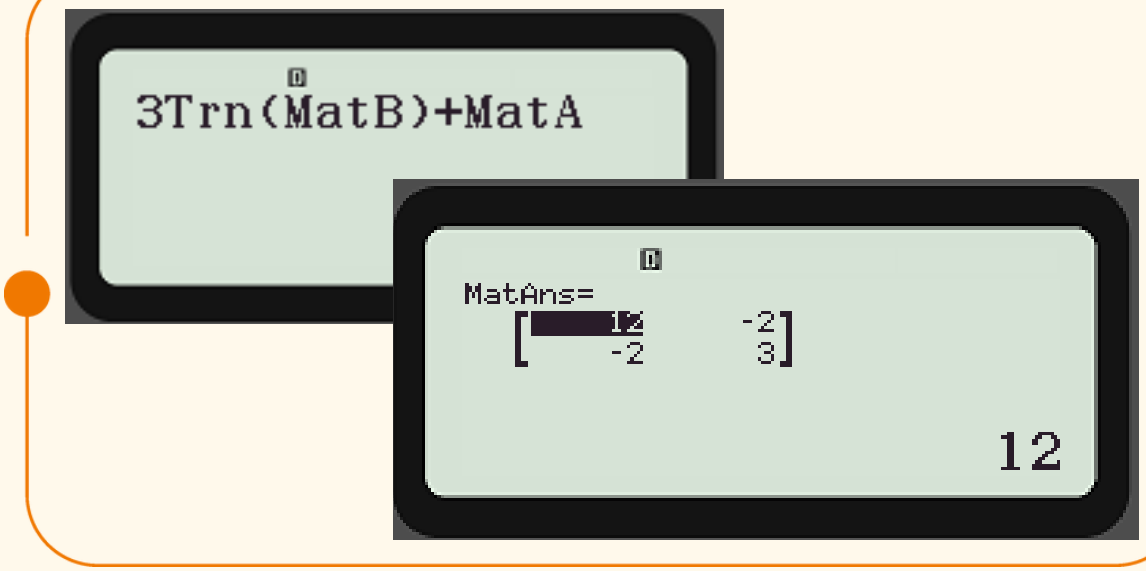


Let's Try:

If given $A = \begin{bmatrix} 3 & -2 \\ -5 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 0 & -2 \end{bmatrix}$

FIND $3B^T + A$

Answer:

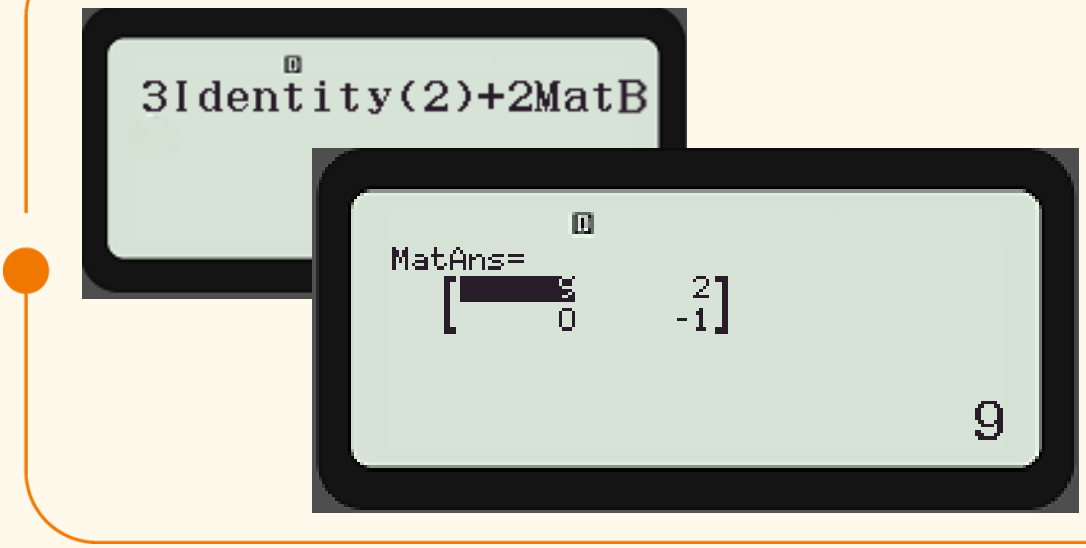


Let's Try:

If given $A = \begin{bmatrix} 3 & -2 \\ -5 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ 0 & -2 \end{bmatrix}$

FIND $3I$ + 2B

Answer:

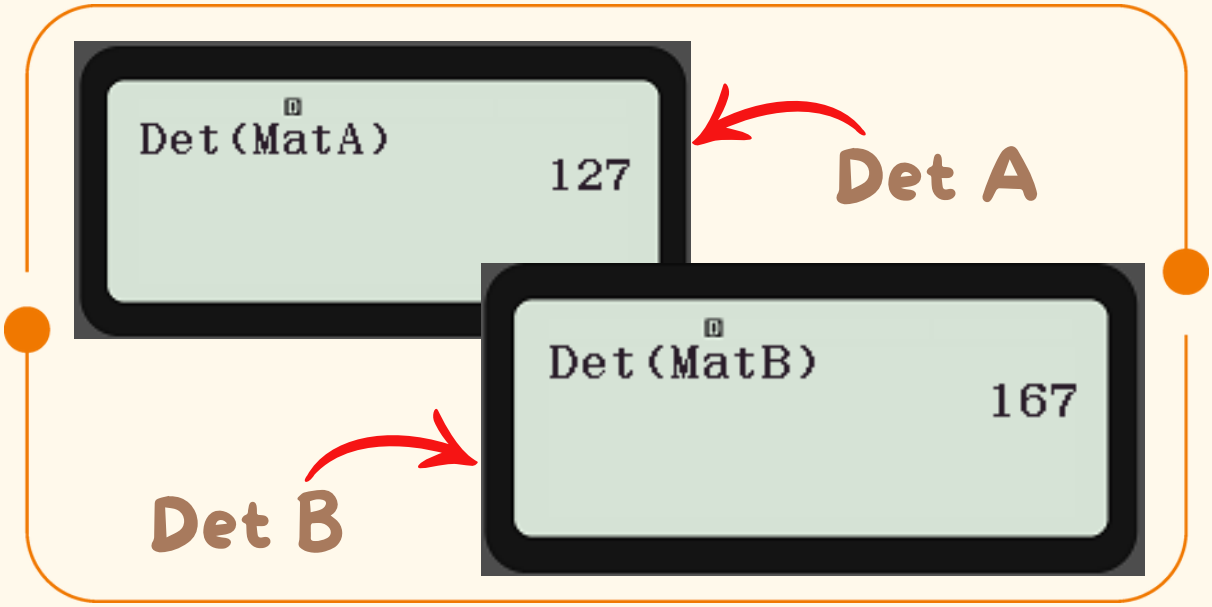


Let's Try:

Find the determinant for the following matrix:

$$A = \begin{bmatrix} 5 & -2 & 3 \\ 4 & -1 & -5 \\ 1 & 3 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 3 & 6 & 7 \\ 5 & 4 & -2 \\ 0 & 1 & -7 \end{bmatrix}$$

Answer:



Let's Try:

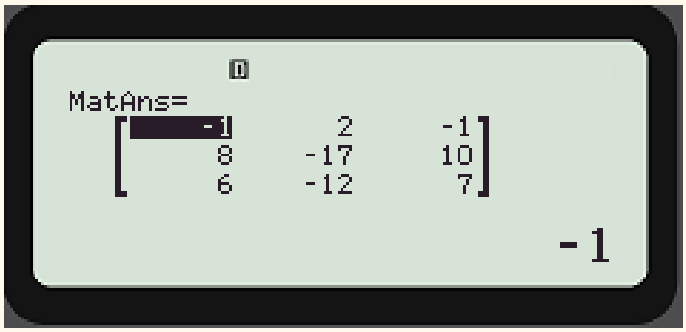
Given the determinant of matrix P = −5. Find:

Adjoin of matrix P

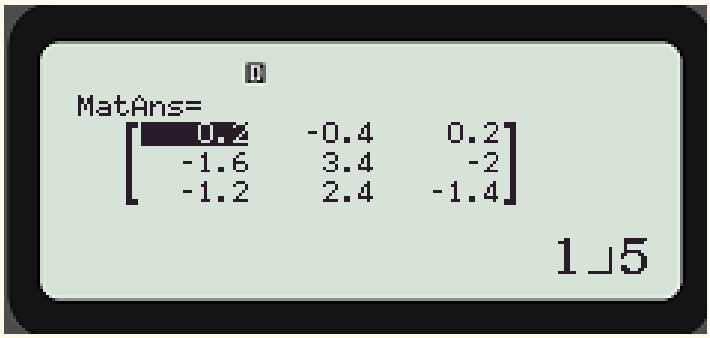
&

Inverse of matrix P

Answer:



Adjoin



Inverse

TUTORIAL

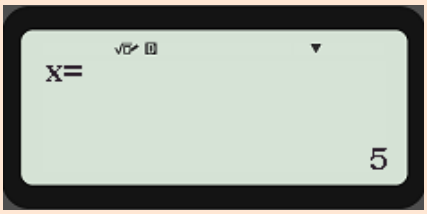
Question :

Solve the following Simultaneous Linear Equations by using **Inverse Method**

$$-x + 4y + z = 0$$
$$x - 2y + z = -2$$
$$3x + y + 2z = 11$$

Answer:

1



2

3

Question :

Solve the following Simultaneous Linear Equations by using **Cramer Method**

$$x + y + z = 5$$
$$x + 2y + 3z = 7$$
$$2x - y - 3z = 3$$

Answer:

1

2

3

Question :

Let's DO THIS

Solve the following Simultaneous Linear Equations by using **Inverse Method**

$$-2x + 3y + z = 6$$
$$x + 2y - z = 19$$
$$-2x + y + z = -20$$

Solve the following Simultaneous Linear Equations by using **Cramer Method**

$$2x - 5y + z = 5$$
$$x - 2y - 2z = -6$$
$$3x - y + 3z = -1$$

Solve the following Simultaneous Linear Equations by using **Inverse Method**

$$2x - y + 3z = 0$$
$$x + 3z = -5$$
$$x + 3y + 4z = -3$$

Question :

Solve the following Simultaneous Linear Equations by using **Cramer Method**

$$x - 6y - 4z = 28$$
$$2x - 3y + 5z = -1$$
$$9x + 7y + 8z = -2$$

Solve the following Simultaneous Linear Equations by using **Inverse Method**

$$5x - 2y - 3z = -31$$
$$4x + 3z = 27$$
$$x - y + 9z = 40$$

Solve the following Simultaneous Linear Equations by using **Cramer Method**

$$3x + 2y + 9z = 40$$
$$2x - y + 6z = 15$$
$$5x + 2y - 4z = -16$$

REFERENCES

References

1. A.J Sadler and D.W.S.Thorning. (2007). *Understanding Pure Mathematics*. Oxford University Press.
2. J.k Backhouse, S.P.T Houldsworth, B.E.D Cooper. (2002). *Pure Mathematics 2 3rd Edition*. Longman.
3. A. Greer, G.W.Taylor. BTEC National NIII. (1989) *Mathematics for Technicians*. Stanley Thorne Ltd.
4. L. Bostock, S. Chandler. (1990) *Core Maths for Advanced Level*. Stanley Thornes
5. Cham J.E, et al. (2011). *Focus SPM Form 4.5 Mathematics*. Penerbitan Pelangi Sdn. Bhd.
6. Casio (2025, Apr 13). *fx-570EX fx-991EX User's Guide*. CASIO Worldwide Education Website. http://edu.casio.com
7. Muridell Calculator Initiative. (2019, Nov 29). How to check an original CASIO fx-991 EX (ClassWiz) scientific calculator [Video]. Youtube. https://www.youtube.com/watch?v=H-KtNDbH3mM
8. Calculator Expert. (2021, Feb 26). How to find the inverse of a matrix with a CASIO Fx-991 EX Classwiz [Video]. Youtube. https://www.youtube.com/watch?v=sbFT0aNsOiU
9. Calculator Expert. (2021, Mar 9). How to find the transpose of a matrix with a CASIO FX-991 EX Classwiz [Video]. https://www.youtube.com/watch?v=jB5h8Xt7hwQ
10. Calculator Expert. (2021, Apr 9). CASIO Classwiz FX-991 EX Matrix Multiplication:How to multiply two matrices [Video]. https://www.youtube.com/watch?v=uz_SE00zBPE
11. Calculator Expert. (2021, Feb 4). How to find determinant of a matrix using a CASIO FX-991 EX Classwiz [Video]. https://www.youtube.com/watch?v=SscI9b_vqOs

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