

Chapter 9 / Example 4

Inverse of a matrix

Use technology to determine the inverse of $P = \begin{pmatrix} 4 & -3 & -2 \\ 2 & 2 & 3 \\ 6 & 1 & -1 \end{pmatrix}$.

Verify that $PP^{-1} = P^{-1}P = I_3$.

Press $\boxed{2\text{nd}} \boxed{[x^{-1}]} \boxed{[\text{MATRX}]} \blacktriangleright \blacktriangleright$ EDIT 1:[A] and press $\boxed{\text{ENTER}}$.

NAMES MATH $\boxed{\text{EDIT}}$
 1:[A]
 2:[B]
 3:[C]
 4:[D]
 5:[E]
 6:[F]
 7:[G]
 8:[H]
 9↓[I]

Change the dimensions of the matrix to 3×3 and press $\boxed{\text{ENTER}}$.

MATRIX[A] 3 × 3
 $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
 [A](1,1)= 0

Enter the values of the elements of the matrix P , using $\boxed{\text{ENTER}}$ to move through the matrix.

MATRIX[A] 3 × 3
 $\begin{bmatrix} 4 & -3 & -2 \\ 2 & 2 & 3 \\ 6 & 1 & -1 \end{bmatrix}$
 [A](3,3)= -1

Press $\boxed{2\text{nd}} \boxed{[\text{MODE}]} \boxed{[\text{QUIT}]}$.

Press $\boxed{2\text{nd}} \boxed{[x^{-1}]} \boxed{[\text{MATRX}]} 1:[A]$ and press $\boxed{\text{ENTER}}$.

Press $\boxed{[x^{-1}]}$ and press $\boxed{\text{ENTER}}$.

$[A]^{-1}$
 $\begin{bmatrix} .0833333333 & .0833333333 & .3333333333 \\ -.3333333333 & -.1333333333 & .1666666667 \\ .1666666667 & .3666666667 & .0833333333 \end{bmatrix}$

Press $\boxed{[\text{ALPHA}]} \boxed{[F1]} 4:\blacktriangleright\text{F}\blacktriangleright\text{D}$ and press $\boxed{\text{ENTER}}$.

The GDC displays the matrix P^{-1} in fractional form.

$\begin{bmatrix} .0833333333 & .0833333333 & .3333333333 \\ -.3333333333 & -.1333333333 & .1666666667 \\ .1666666667 & .3666666667 & .0833333333 \end{bmatrix}$
 Ans $\blacktriangleright\text{F}\blacktriangleright\text{D}$
 $\begin{bmatrix} \frac{1}{12} & \frac{1}{12} & \frac{1}{3} \\ -\frac{1}{3} & -\frac{2}{15} & \frac{1}{5} \\ \frac{1}{6} & \frac{11}{30} & \frac{7}{30} \end{bmatrix}$

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Press $\boxed{2\text{nd}} \boxed{x^{-1}} \boxed{\text{[MATRX]}} 1:[A]$ and press $\boxed{\text{ENTER}}$.

Press $\boxed{\times}$.

Press $\boxed{2\text{nd}} \boxed{x^{-1}} \boxed{\text{[MATRX]}} 1:[A]$ and press $\boxed{\text{ENTER}}$.

Press $\boxed{x^{-1}}$ and press $\boxed{\text{ENTER}}$.

$$\mathbf{P} \cdot \mathbf{P}^{-1} = \mathbf{I}$$

$$\begin{bmatrix} \frac{1}{12} & \frac{1}{12} & \frac{1}{12} \\ -\frac{1}{3} & -\frac{2}{15} & \frac{4}{15} \\ \frac{1}{6} & \frac{11}{30} & -\frac{7}{30} \end{bmatrix} \cdot \begin{bmatrix} \frac{1}{12} & \frac{1}{12} & \frac{1}{12} \\ -\frac{1}{3} & -\frac{2}{15} & \frac{4}{15} \\ \frac{1}{6} & \frac{11}{30} & -\frac{7}{30} \end{bmatrix}^{-1}$$

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

Press $\boxed{2\text{nd}} \boxed{x^{-1}} \boxed{\text{[MATRX]}} 1:[A]$ and press $\boxed{\text{ENTER}}$.

Press $\boxed{x^{-1}}$.

Press $\boxed{\times}$.

Press $\boxed{2\text{nd}} \boxed{x^{-1}} \boxed{\text{[MATRX]}} 1:[A]$ and press $\boxed{\text{ENTER}}$.

Press $\boxed{\text{ENTER}}$.

$$\mathbf{P}^{-1} \cdot \mathbf{P} = \mathbf{I}$$

$$\begin{bmatrix} \frac{1}{12} & \frac{1}{12} & \frac{1}{12} \\ -\frac{1}{3} & -\frac{2}{15} & \frac{4}{15} \\ \frac{1}{6} & \frac{11}{30} & -\frac{7}{30} \end{bmatrix}^{-1} \cdot \begin{bmatrix} \frac{1}{12} & \frac{1}{12} & \frac{1}{12} \\ -\frac{1}{3} & -\frac{2}{15} & \frac{4}{15} \\ \frac{1}{6} & \frac{11}{30} & -\frac{7}{30} \end{bmatrix}$$

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