

Accelerated Precalculus

5.01-5.04 Quiz Review WS #2: Matrix Operations and Inverses

Key

Perform the given operation. If it is not possible, write undefined and explain why.

$$1. \begin{bmatrix} -5 & 8 \\ 4 & -3 \end{bmatrix} - \left(2 \begin{bmatrix} 5 & 1 & 4 \\ -9 & 3 & 0 \end{bmatrix} \begin{bmatrix} 1 & 5 \\ 7 & 4 \\ 8 & 11 \end{bmatrix} \right)$$

$\begin{matrix} 2 \times 3 & 3 \times 2 \\ \downarrow & \downarrow \end{matrix}$

$$\begin{bmatrix} 10 & 2 & 8 \\ -18 & 6 & 0 \end{bmatrix} \begin{matrix} \frac{10(1)+2(7)+8(8)}{-18(1)+6(7)+8(0)} & \frac{10(5)+2(4)+8(11)}{-18(5)+4(6)+11(0)} \end{matrix} \rightarrow \begin{bmatrix} 88 & 146 \\ 24 & -66 \end{bmatrix}$$

$$\begin{bmatrix} -5 & 8 \\ 4 & -3 \end{bmatrix} - \begin{bmatrix} 88 & 146 \\ 24 & -66 \end{bmatrix} = \begin{bmatrix} -93 & -138 \\ -20 & 63 \end{bmatrix}$$

$$2. 2 \begin{bmatrix} -1 & -4 & 3 \\ 2 & 7 & -1 \end{bmatrix} - 4 \begin{bmatrix} 4 & -5 & 6 \\ -1 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} -2 & -8 & 6 \\ 4 & 14 & -2 \end{bmatrix} - \begin{bmatrix} 16 & -20 & 24 \\ -4 & 0 & 4 \end{bmatrix} = \begin{bmatrix} -18 & 12 & -18 \\ 8 & 14 & -6 \end{bmatrix}$$

$$3. 5 \begin{bmatrix} 6 & 7 \\ 2 & 2 \\ 5 & 0 \end{bmatrix} - 3 \begin{bmatrix} 1 & 7 & 0 \\ -8 & 4 & 1 \end{bmatrix}$$

not possible since dimensions are not alike.

$$4. [2 \ -1 \ 5 \ 3 \ -1] \cdot 2 \begin{bmatrix} 4 \\ -2 \\ 1 \\ 4 \\ -1 \\ -6 \end{bmatrix}$$

$\begin{matrix} 1 \times 5 & 6 \times 1 \\ \downarrow & \downarrow \\ \times \end{matrix}$

Not possible. Inner dimensions do not match to allow for multiplication

$$5. 2 \begin{bmatrix} 1 & -1 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} -3 & -1 & 0 & 5 \\ -5 & 7 & 2 & 3 \end{bmatrix} \rightarrow \begin{matrix} 2 \times 2 & 2 \times 4 \\ \downarrow & \downarrow \end{matrix}$$

$$\begin{bmatrix} 2 & -2 \\ 12 & 2 \end{bmatrix} \begin{matrix} \begin{bmatrix} -3 & -1 & 0 & 5 \\ -5 & 7 & 2 & 3 \end{bmatrix} \\ \frac{2(-3)+5(2)}{-3(12)+2(-5)} \quad \frac{2(-1)+2(7)}{12(-1)+2(7)} \quad \frac{2(0)+3(2)}{12(0)+2(2)} \quad \frac{2(5)+3(-2)}{12(5)+2(3)} \end{matrix}$$

$$\begin{bmatrix} 4 & -16 & -4 & 4 \\ -46 & 2 & 4 & 66 \end{bmatrix}$$

* If $[A][B] = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then matrices A and B would be inverses of each other.

Determine if [A] and [B] are inverses by using matrix multiplication and explain why.

6. $A = \begin{bmatrix} 2 & 5 \\ 2 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -5 \\ 2 & 2 \end{bmatrix}$

$$\begin{bmatrix} 2 & 5 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & -5 \\ 2 & 2 \end{bmatrix} \rightarrow \begin{bmatrix} 12 & 0 \\ 4 & -8 \end{bmatrix} \neq \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Matrix A and B are not inverses.

Evaluate the following.

7. ~~$\det \begin{bmatrix} 2 & 2 \\ 5 & 6 \end{bmatrix}$~~ $6(-2) - 5(2) = -12 - 10 = \boxed{-22}$ -22

8. ~~$\begin{bmatrix} 5 & -12 \\ 3 & -1 \end{bmatrix}$~~ $5(-1) - 3(-12) = -5 + 36 = \boxed{31}$ 31

Find the inverse of the following matrices. If it's not possible, state not possible and why.

9. $R = \begin{bmatrix} -4 & 2 \\ -5 & 1 \end{bmatrix}$ $\det(R) = -4(1) - 2(-5) = -4 + 10 = 6$

$$R^{-1} = \frac{1}{6} \begin{bmatrix} 1 & -2 \\ 5 & -4 \end{bmatrix} = \begin{bmatrix} 1/6 & -2/6 \\ 5/6 & -4/6 \end{bmatrix}$$

$$\begin{bmatrix} 1/6 & -1/3 \\ 5/6 & -2/3 \end{bmatrix}$$

10. $B = \begin{bmatrix} 4 & 7 \\ -1 & -3 \end{bmatrix}$ $\det(B) = 4(-3) - 7(-1) = -12 + 7 = -5$

$$B^{-1} = \frac{1}{-5} \begin{bmatrix} -3 & -7 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 3/5 & 7/5 \\ -1/5 & -4/5 \end{bmatrix}$$

$$\begin{bmatrix} 3/5 & 7/5 \\ -1/5 & -4/5 \end{bmatrix}$$

11. $W = \begin{bmatrix} 3 & 7 \\ -2 & -1 \end{bmatrix}$ $\det(W) = 3(-1) - 7(-2) = -3 + 14 = 11$

$$W^{-1} = \frac{1}{11} \begin{bmatrix} -1 & -7 \\ 2 & 3 \end{bmatrix}$$

$$\begin{bmatrix} -1/11 & -7/11 \\ 2/11 & 3/11 \end{bmatrix}$$

Find the value for the missing element that would matrix F singular.

12. $G = \begin{bmatrix} -3 & x \\ -8 & 4 \end{bmatrix}$

* set $ad - bc = 0$

$$\begin{aligned} -3(4) - (-8)(x) &= 0 \\ -12 + 8x &= 0 \end{aligned}$$

$$8x = 12$$

$$x = \frac{12}{8} = \boxed{\frac{3}{2}}$$

$$\boxed{x = \frac{3}{2}}$$