

Multiplying Matrices

State whether the product is defined. If so, give the dimensions of AB.

1. A:  $3 \times 3$ , B:  $3 \times 1$   $\rightarrow 3 \times 1$
2. A:  $2 \times 3$ , B:  $2 \times 3$  Fail
3. A:  $3 \times 1$ , B:  $1 \times 3$   $\rightarrow 3 \times 3$
4. A:  $3 \times 3$ , B:  $1 \times 3$  Fail
5. A:  $2 \times 2$ , B:  $2 \times 2$   $\rightarrow 2 \times 2$

Find the product by hand or with help for basic calculations using a calculator. Then check your answers using a graphing calculator and the MATRIX capabilities. If not defined, state the reason.

6.  $2 \times 2 \cdot 2 \times 3$   
 $\begin{bmatrix} 1 & 4 \\ -2 & 7 \end{bmatrix} \begin{bmatrix} -1 & 0 & 3 \\ -2 & 4 & 1 \end{bmatrix} = \begin{bmatrix} -9 & 16 & 7 \\ -12 & 28 & 1 \end{bmatrix}$

11.  $\begin{bmatrix} 3 & 10 \\ 8 & -5 \end{bmatrix} \begin{bmatrix} -2 & 9 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 44 & -3 \\ -41 & 87 \end{bmatrix}$

7.  $1 \times 3 \cdot 3 \times 1 = 1 \times 1$   
 $\begin{bmatrix} 4 & 5 & -4 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \\ 11 \end{bmatrix} = 20 + 30 - 44 = 6$

12.  $\begin{bmatrix} 3 & -7 & 6 \\ 11 & -4 & 0 \end{bmatrix} \begin{bmatrix} 2 & -8 & 1 \\ 8 & -2 & -5 \end{bmatrix}$  Dimension Mismatch  
 $2 \times 3 \cdot 2 \times 3$

8.  $\begin{bmatrix} -1 & 7 \\ 9 & 0 \end{bmatrix} \begin{bmatrix} 2 & 1 & 8 \\ 7 & -3 & 7 \\ 4 & 1 & 0 \end{bmatrix}$  D.M.  
 $2 \times 2 \cdot 3 \times 3$  Fail

13.  $\begin{bmatrix} 1 & -1 \\ 2 & \frac{1}{4} \\ 2 & \frac{1}{4} \end{bmatrix} \begin{bmatrix} 0 & \frac{3}{4} \\ 3 & -\frac{1}{4} \end{bmatrix} = \begin{bmatrix} 0-3 & \frac{3}{4}-\frac{1}{4} \\ 0-\frac{3}{4} & \frac{3}{4}-\frac{1}{4} \end{bmatrix} = \begin{bmatrix} -3 & \frac{5}{8} \\ \frac{3}{4} & \frac{23}{16} \end{bmatrix}$

9.  $3 \times 2 \cdot 2 \times 3 = 3 \times 3$   
 $\begin{bmatrix} 6 & -8 \\ 3 & 5 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 4 \\ -5 & 11 & 2 \end{bmatrix} = \begin{bmatrix} 28 & -88 & 8 \\ -31 & 55 & 22 \\ -20 & 44 & 8 \end{bmatrix}$

14.  $\begin{bmatrix} 2 & 1.4 \\ 4 & 1.5 \end{bmatrix} \begin{bmatrix} -3 & 2.1 \\ .5 & 2.2 \end{bmatrix} = \begin{bmatrix} 0.64 & 3.5 \\ 0.63 & 4.14 \end{bmatrix}$

10.  $\begin{bmatrix} 1 \\ 4 \end{bmatrix} \begin{bmatrix} 5 & 3 & 4 \end{bmatrix}$   
 $2 \times 1 \cdot 1 \times 3 = 2 \times 3$   
 $\begin{bmatrix} 5 & 3 & 4 \\ 20 & 12 & 16 \end{bmatrix}$

15.  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \frac{1}{3} & -2 \\ 5 & \frac{2}{6} \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & -2 \\ 5 & \frac{1}{3} \end{bmatrix}$