Section 16.2

(3) $$\begin{bmatrix} 4 & -2 \end{bmatrix}\begin{bmatrix} -1 & 0 \\ 2 & 6 \end{bmatrix} = \begin{bmatrix} -8 & -12 \end{bmatrix}$$

(5) $$\begin{bmatrix} 2 & -3 & 1 \\ 0 & 7 & -3 \end{bmatrix}\begin{bmatrix} 90 \\ -25 \\ 50 \end{bmatrix} = \begin{bmatrix} 305 \\ -325 \end{bmatrix}$$

(7) $$\begin{bmatrix} -8 & \frac{3}{4} \\ \frac{7}{2} & -8 \\ -6 & \frac{4}{5} \end{bmatrix}\begin{bmatrix} \frac{1}{4} & -3 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} -0.5 & 27.75 \\ -15.125 & -50.5 \\ 0.1 & 22 \end{bmatrix} \text{ or } \begin{bmatrix} -\frac{1}{2} & \frac{111}{4} \\ -\frac{121}{8} & -\frac{101}{2} \\ \frac{1}{10} & 22 \end{bmatrix}$$

(9) $$\begin{bmatrix} -1 & 7 \\ 3 & 5 \\ 10 & -1 \\ -5 & 12 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 33 & -22 \\ 31 & -12 \\ 15 & 13 \\ 50 & -41 \end{bmatrix}$$

(11) $$\begin{bmatrix} 2 & -3 \\ 5 & -1 \end{bmatrix}\begin{bmatrix} 3 & 0 & -1 \\ 7 & -5 & 8 \end{bmatrix} = \begin{bmatrix} -15 & 15 & -26 \\ 8 & 5 & -13 \end{bmatrix}$$

(13) $$\begin{bmatrix} -9.2 & 2.3 & 0.5 \\ -3.8 & -2.4 & 9.2 \end{bmatrix}\begin{bmatrix} 6.5 & -5.2 \\ 4.9 & 1.7 \\ -1.8 & 6.9 \end{bmatrix} = \begin{bmatrix} -49.43 & 55.2 \\ -53.02 & 79.16 \end{bmatrix}$$

(17) $AB = \begin{bmatrix} -10 & 25 & 40 \\ 42 & -5 & 0 \end{bmatrix} \begin{bmatrix} 6 \\ -15 \\ 12 \end{bmatrix}$

$= \begin{bmatrix} 45 \\ 327 \end{bmatrix}$

BA is undefined.

Sizes: $(3 \times 1)(2 \times 3)$

$\uparrow \uparrow$

These numbers must be equal in order for the product to be defined.

(23) Rephrased: Check if $AB = I$

$AB = \begin{bmatrix} 5 & -2 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix}$

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

Yes, A and B are inverses of each other.

(25) Rephrased : Check if $AB = I$

$$AB = \begin{bmatrix} 1 & -2 & 3 \\ 2 & -5 & 7 \\ -1 & 3 & -5 \end{bmatrix} \begin{bmatrix} 4 & -1 & 1 \\ 3 & -2 & -1 \\ 1 & -1 & -1 \end{bmatrix}$$

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

Yes, A and B are inverses of each other.

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

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

$$= A$$

(39) $A^2 - I = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}\begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$= \begin{bmatrix} 16 & 28 \\ 21 & 37 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$= \begin{bmatrix} 15 & 28 \\ 21 & 36 \end{bmatrix}$

$(A + I)(A - I) = \left(\begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right)\left(\begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right)$

$= \begin{bmatrix} 3 & 4 \\ 3 & 6 \end{bmatrix}\begin{bmatrix} 1 & 4 \\ 3 & 4 \end{bmatrix}$

$= \begin{bmatrix} 15 & 28 \\ 21 & 36 \end{bmatrix}$

Therefore $A^2 - I = (A + I)(A - I)$
for this matrix A.