SCALAR MULTIPLICATION In matrix algebra, a real number is often called a **scalar**. To multiply a matrix by a scalar, you multiply each element in the matrix by the scalar. This process is called **scalar multiplication**.

EXAMPLE 2 Multiply a matrix by a scalar

COMPARE ORDER OF OPERATIONS
The order of operations for matrix expressions is similar to that for real numbers. In particular, you perform scalar multiplication before matrix addition and subtraction.

Perform the indicated operation, if possible.

a. $$-2\begin{bmatrix} 4 & -1 \\ 1 & 0 \\ 2 & 7 \end{bmatrix} = \begin{bmatrix} -2(4) & -2(-1) \\ -2(1) & -2(0) \\ -2(2) & -2(7) \end{bmatrix} = \begin{bmatrix} -8 & 2 \\ -2 & 0 \\ -4 & -14 \end{bmatrix}$$

b. $$4\begin{bmatrix} -2 & -8 \\ 5 & 0 \end{bmatrix} + \begin{bmatrix} -3 & 8 \\ 6 & -5 \end{bmatrix} = \begin{bmatrix} 4(-2) & 4(-8) \\ 4(5) & 4(0) \end{bmatrix} + \begin{bmatrix} -3 & 8 \\ 6 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} -8 & -32 \\ 20 & 0 \end{bmatrix} + \begin{bmatrix} -3 & 8 \\ 6 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} -8 + (-3) & -32 + 8 \\ 20 + 6 & 0 + (-5) \end{bmatrix}$$

$$= \begin{bmatrix} -11 & -24 \\ 26 & -5 \end{bmatrix}$$

✓ GUIDED PRACTICE for Examples 1 and 2

Perform the indicated operation, if possible.

1. $\begin{bmatrix} -2 & 5 & 11 \\ 4 & -6 & 8 \end{bmatrix} + \begin{bmatrix} -3 & 1 & -5 \\ -2 & -8 & 4 \end{bmatrix}$

2. $\begin{bmatrix} -4 & 0 \\ 7 & -2 \\ -3 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 2 \\ -3 & 0 \\ 5 & -14 \end{bmatrix}$

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

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

MATRIX PROPERTIES Many of the properties you have used with real numbers can be applied to matrices as well.

CONCEPT SUMMARY *For Your Notebook*

Properties of Matrix Operations

Let A, B, and C be matrices with the same dimensions, and let k be a scalar.

Associative Property of Addition	$(A + B) + C = A + (B + C)$
Commutative Property of Addition	$A + B = B + A$
Distributive Property of Addition	$k(A + B) = kA + kB$
Distributive Property of Subtraction	$k(A - B) = kA - kB$