8 - 16 Addition and scalar multiplication of matrices and vectors. Let the 5 matrices and 3 vectors for this section be defined below:

$$\mathbf{A} = \begin{pmatrix} 0 & 2 & 4 \\ 6 & 5 & 5 \\ 1 & 0 & -3 \end{pmatrix}$$

$$\mathbf{B} = \begin{pmatrix} 0 & 5 & 2 \\ 5 & 3 & 4 \\ -2 & 4 & -2 \end{pmatrix}$$

$$\mathbf{CC} = \begin{pmatrix} 5 & 2 \\ -2 & 4 \\ 1 & 0 \end{pmatrix}$$

$$\mathbf{DD} = \begin{pmatrix} -4 & 1 \\ 5 & 0 \\ 2 & -1 \end{pmatrix}$$

$$\mathbf{EE} = \begin{pmatrix} 0 & 2 \\ 3 & 4 \\ 3 & -1 \end{pmatrix}$$

```
{{0, 2, 4}, {6, 5, 5}, {1, 0, -3}}
```

```
{{0, 5, 2}, {5, 3, 4}, {-2, 4, -2}}
```

```
{{5, 2}, {-2, 4}, {1, 0}}
```

```
{{-4, 1}, {5, 0}, {2, -1}}
```

```
{{0, 2}, {3, 4}, {3, -1}}
```

```
bu = {{1.5}, {0}, {-3}}
bv = {{-1}, {3}, {2}}
bw = {{-5}, {-30}, {10}}
```

```
{{1.5}, {0}, {-3}}
```

```
{{-1}, {3}, {2}}
```

```
{{-5}, {-30}, {10}}
```

Find the following expressions, indicating which of the rules in (3) or (4) they illustrate, or give reasons why they are not defined.

9. 3 A, 0.5 B, 3 A + 0.5 B, 3 A + 0.5 B + C

```
3 A // MatrixForm
```

$$\begin{pmatrix} 0 & 6 & 12 \\ 18 & 15 & 15 \\ 3 & 0 & -9 \end{pmatrix}$$

```
0.5 B // MatrixForm
```

$$\begin{pmatrix} 0. & 2.5 & 1. \\ 2.5 & 1.5 & 2. \\ -1. & 2. & -1. \end{pmatrix}$$

```
(3 A + 0.5 B) // MatrixForm
```

$$\begin{pmatrix} 0. & 8.5 & 13. \\ 20.5 & 16.5 & 17. \\ 2. & 2. & -10. \end{pmatrix}$$

```
3 A + .5 B + C
```

```
{{0. + C, 8.5 + C, 13. + C},
 {20.5 + C, 16.5 + C, 17. + C}, {2. + C, 2. + C, -10. + C}}
```

Above: Some interpretation needed. In the 4th problem part, since the operation with C is not defined, Mathematica leaves the addend in symbolical form.

11. 8 C + 10 D, 2 (5 D + 4 C), 0.6 C - 0.6 D, 0.6 (C - D)

```
(8 CC + 10 DD) // MatrixForm
```

$$\begin{pmatrix} 0 & 26 \\ 34 & 32 \\ 28 & -10 \end{pmatrix}$$

```
2 (5 DD + 4 CC) // MatrixForm
```

$$\begin{pmatrix} 0 & 26 \\ 34 & 32 \\ 28 & -10 \end{pmatrix}$$

```
0.6 CC - 0.6 DD // MatrixForm
```

$$\begin{pmatrix} 5.4 & 0.6 \\ -4.2 & 2.4 \\ -0.6 & 0.6 \end{pmatrix}$$

```
0.6 (CC - DD) // MatrixForm
```

$$\begin{pmatrix} 5.4 & 0.6 \\ -4.2 & 2.4 \\ -0.6 & 0.6 \end{pmatrix}$$

13. (2 · 7) C, 2 (7 C), -D + 0 E, E - D + C + u

```
2 × 7 CC // MatrixForm
```

$$\begin{pmatrix} 70 & 28 \\ -28 & 56 \\ 14 & 0 \end{pmatrix}$$

```
2 (7 CC) // MatrixForm
```

$$\begin{pmatrix} 70 & 28 \\ -28 & 56 \\ 14 & 0 \end{pmatrix}$$

```
-DD + 0 E // MatrixForm
```

$$\begin{pmatrix} 4 & -1 \\ -5 & 0 \\ -2 & 1 \end{pmatrix}$$

```
EE - DD + CC + bu
```

Thread::tdlen: Objects of unequal length in {0, 2} + {4, −1} + {5, 2} + {1.5} cannot be combined >>

Thread::tdlen: Objects of unequal length in {3, 4} + {−5, 0} + {−2, 4} + {0} cannot be combined >>

Thread::tdlen: Objects of unequal length in {3, −1} + {−2, 1} + {1, 0} + {−3} cannot be combined >>

General::stop: Further output of Thread::tdlen will be suppressed during this calculation >>

```
{{1.5} + {0, 2} + {4, -1} + {5, 2},
 {0} + {-5, 0} + {-2, 4} + {3, 4}, {-3} + {-2, 1} + {1, 0} + {3, -1}}
```

15. (u + v) - w, u + (v - w), C + 0 w, 0 E + u - v

```
(bu + bv) - bw
```

```
{{5.5}, {33}, {-11}}
```

```
bu + (bv - bw)
```

```
{{5.5}, {33}, {-11}}
```

```
CC + 0 bw
```

Thread::tdlen: Objects of unequal length in {5, 2} + {0} cannot be combined >>

Thread::tdlen: Objects of unequal length in {−2, 4} + {0} cannot be combined >>

Thread::tdlen: Objects of unequal length in {1, 0} + {0} cannot be combined >>

General::stop: Further output of Thread::tdlen will be suppressed during this calculation >>

```
{{0} + {5, 2}, {0} + {-2, 4}, {0} + {1, 0}}
```

```
0 EE + bu - bv
```

Thread::tdlen: Objects of unequal length in {0, 0} + {1.5} + {1} cannot be combined >>

Thread::tdlen: Objects of unequal length in {0, 0} + {0} + {−3} cannot be combined >>

Thread::tdlen: Objects of unequal length in {0, 0} + {−3} + {−2} cannot be combined >>

General::stop: Further output of Thread::tdlen will be suppressed during this calculation >>

```
{{1} + {1.5} + {0, 0}, {-3} + {0} + {0, 0}, {-3} + {-2} + {0, 0}}
```

17. u + v + w

```
bu + bv + bw
```

```
{{-4.5}, {-27}, {9}}
```

All of the calculations and operations in this section, above, agree with the answers in the text.