ANSWERS to Lecture 9 problems

1. $3\mathbf{A} = \begin{pmatrix} 6 & 9 \\ 12 & 18 \end{pmatrix}$ $\mathbf{A} + \mathbf{B} = \begin{pmatrix} 4 & 2 \\ 9 & 10 \end{pmatrix}$ $3\mathbf{B} - 2\mathbf{C} = \begin{pmatrix} 14 & -7 \\ 15 & 10 \end{pmatrix}$

2. (a) $\begin{pmatrix} 18 \\ 36 \end{pmatrix}$ (b) $\begin{pmatrix} 2 \\ 31 \end{pmatrix}$ (c) $\begin{pmatrix} 20 \\ 67 \end{pmatrix}$ (d) $\begin{pmatrix} 20 \\ 67 \end{pmatrix}$

   The transformation effected by the sum of the two matrices is the same as the vector sum of two separate transformations.

3. (a) $\mathbf{AB} = \begin{pmatrix} 19 & 10 \\ 38 & 20 \end{pmatrix}$ (b) $\mathbf{BC} = \begin{pmatrix} -8 & 3 \\ -20 & 14 \end{pmatrix}$ (c) $\mathbf{CB} = \begin{pmatrix} 2 & 12 \\ 5 & 4 \end{pmatrix}$ (d) $\mathbf{AC} = \begin{pmatrix} -8 & 7 \\ -16 & 14 \end{pmatrix}$

   (e) $(\mathbf{AB})\mathbf{C} = \begin{pmatrix} -76 & 48 \\ -152 & 96 \end{pmatrix}$ (f) same as (e).

   (g) $(\mathbf{A} + \mathbf{B})\mathbf{C} = \begin{pmatrix} -16 & 10 \\ -36 & 28 \end{pmatrix}$ (h) same as (g).

   Matrix multiplication is associative ((e) and (f)), distributive ((g) and (h)), but not commutative ((b) and (c)).

4. $\mathbf{ED} = \begin{pmatrix} 12 & 10 & 2 & 12 \\ 0 & 2 & 1 & -9 \\ 4 & 8 & 3 & -17 \end{pmatrix}$ $\mathbf{FE} = \begin{pmatrix} 14 & 4 \\ 1 & 19 \\ 1 & -5 \end{pmatrix}$ $\mathbf{F}^2 = \begin{pmatrix} 5 & 1 & 7 \\ 6 & 5 & 12 \\ -3 & -1 & -2 \end{pmatrix}$

   All other combinations are meaningless.

5. $\begin{pmatrix} -1 & 2 \\ \frac{5}{3} & -3 \end{pmatrix}$.

6. $\begin{pmatrix} -1.964 \\ 4.598 \end{pmatrix}$