1.4.3 Answers to Exercise.

1. Yes.

$$AB = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix} = BA.$$

2. No.

$$AB = \begin{bmatrix} 4 & 3 & 2 & 1 \\ 3 & 3 & 2 & 1 \\ 2 & 2 & 2 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}, BA = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 2 & 2 \\ 1 & 2 & 3 & 3 \\ 1 & 2 & 3 & 4 \end{bmatrix}.$$

3. (a) ——
   (b) ——
   (c) *Comment.*
   It happens that $AB = \mathcal{O}_{3\times 3}$ and $BA = \mathcal{O}_{3\times 3}$.

4. (a) ——
   (b) *Comment.*
   The key is: $(GAH)(GBH) = (GA)(HG)(BH) = (GA)I_p(BH) = G(AB)H$, and $(GBH)(GAH) = G(BA)H$.

5. ——
6. ——
7. ——
8. ——
9. ——
10. ——
11. ——
12. (a) One possible choice for $\alpha, \beta, \gamma, \delta$ is '$\alpha = 1$, $\beta = 1$, $\gamma = 2$, $\delta = -1$'.
    (b) ——
13. ——