Mathematical Exercise

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This is **exercise** 1 for Foundations of Mathematical, WS24. Generated on 2024-10-28 with 10 problems per section.

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1. Introduction

! Practice makes perfect.

We need many exercises to master the skill of mathmatical. However, it's not easy to find the exercise which just fit for you.

So, I create this repo to generate the exercise for you.

Just enjoy it!

The syntax of this document is Quarto syntax, which is a markdown-based language. It is designed to be human-readable and easy to write, while also being powerful enough to support complex document structures.

You can check the syllabus of this course in the following link: Syllabus°.

2. Exercise

2.1. Vector Arithmetic

2.1.1. Addition

1. Let $\mathbf{u} = \begin{bmatrix} 0 \\ 8 \\ 0 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 3 \\ -3 \\ -1 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
2. Let $\mathbf{u} = \begin{bmatrix} -7 \\ -6 \\ -6 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -8 \\ -7 \\ -9 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
3. Let $\mathbf{u} = \begin{bmatrix} 10 \\ 1 \\ 7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 8 \\ 6 \\ 2 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
4. Let $\mathbf{u} = \begin{bmatrix} 5 \\ -7 \\ 5 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -2 \\ 8 \\ -10 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
5. Let $\mathbf{u} = \begin{bmatrix} 0 \\ -9 \\ -7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -5 \\ 4 \\ -2 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
6. Let $\mathbf{u} = \begin{bmatrix} -8 \\ 5 \\ -10 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 3 \\ 4 \\ -9 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
7. Let $\mathbf{u} = \begin{bmatrix} -10 \\ 7 \\ 9 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -6 \\ 0 \\ -5 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
8. Let $\mathbf{u} = \begin{bmatrix} 8 \\ -2 \\ -9 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 9 \\ -1 \\ 8 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
9. Let $\mathbf{u} = \begin{bmatrix} 4 \\ 0 \\ 8 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -10 \\ 3 \\ 2 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.
10. Let $\mathbf{u} = \begin{bmatrix} -1 \\ -2 \\ -7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 1 \\ -6 \\ 9 \end{bmatrix}$. Compute $\mathbf{u} + \mathbf{v}$.

2.1.2. Subtraction

1. Let $\mathbf{u} = \begin{bmatrix} 7 \\ -3 \\ 5 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 10 \\ 8 \\ -9 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
2. Let $\mathbf{u} = \begin{bmatrix} 5 \\ 3 \\ -7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -4 \\ -5 \\ 0 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
3. Let $\mathbf{u} = \begin{bmatrix} -6 \\ 10 \\ -6 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 8 \\ 0 \\ 3 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
4. Let $\mathbf{u} = \begin{bmatrix} 7 \\ 2 \\ 10 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -1 \\ -5 \\ 4 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
5. Let $\mathbf{u} = \begin{bmatrix} 6 \\ -8 \\ 6 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 9 \\ 4 \\ -6 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
6. Let $\mathbf{u} = \begin{bmatrix} 8 \\ -6 \\ -7 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 9 \\ -4 \\ 3 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.

7. Let $\mathbf{u} = \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 6 \\ 9 \\ -8 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
8. Let $\mathbf{u} = \begin{bmatrix} 3 \\ -9 \\ 10 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -10 \\ -1 \\ 5 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
9. Let $\mathbf{u} = \begin{bmatrix} 8 \\ 6 \\ -1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.
10. Let $\mathbf{u} = \begin{bmatrix} 2 \\ -5 \\ 3 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 10 \\ 8 \\ -7 \end{bmatrix}$. Compute $\mathbf{u} - \mathbf{v}$.

2.1.3. Scalar Multiplication

1. Let $\mathbf{u} = \begin{bmatrix} 5 \\ 1 \\ -8 \end{bmatrix}$. Compute $-2\mathbf{v}$.
2. Let $\mathbf{u} = \begin{bmatrix} -7 \\ 5 \\ -10 \end{bmatrix}$. Compute $5\mathbf{v}$.
3. Let $\mathbf{u} = \begin{bmatrix} 3 \\ -5 \\ -6 \end{bmatrix}$. Compute $1\mathbf{v}$.
4. Let $\mathbf{u} = \begin{bmatrix} -4 \\ -1 \\ -6 \end{bmatrix}$. Compute $4\mathbf{v}$.
5. Let $\mathbf{u} = \begin{bmatrix} 3 \\ -1 \\ 4 \end{bmatrix}$. Compute $-9\mathbf{v}$.
6. Let $\mathbf{u} = \begin{bmatrix} -9 \\ -1 \\ -6 \end{bmatrix}$. Compute $4\mathbf{v}$.
7. Let $\mathbf{u} = \begin{bmatrix} 3 \\ 5 \\ -5 \end{bmatrix}$. Compute $-7\mathbf{v}$.
8. Let $\mathbf{u} = \begin{bmatrix} -2 \\ -6 \\ 2 \end{bmatrix}$. Compute $9\mathbf{v}$.
9. Let $\mathbf{u} = \begin{bmatrix} 2 \\ -4 \\ 0 \end{bmatrix}$. Compute $1\mathbf{v}$.
10. Let $\mathbf{u} = \begin{bmatrix} -10 \\ 1 \\ 2 \end{bmatrix}$. Compute $-8\mathbf{v}$.

2.2. Matrix Arithmetic

2.2.1. Addition

1. Let $A = \begin{bmatrix} 9 & 2 & 0 \\ 4 & -6 & -7 \\ 5 & -10 & -7 \end{bmatrix}$ and $B = \begin{bmatrix} -10 & -4 & 2 \\ 6 & -9 & -7 \\ -2 & -10 & -10 \end{bmatrix}$. Compute $A + B$.
2. Let $A = \begin{bmatrix} -5 & -10 & -5 \\ 2 & -9 & 4 \\ -3 & -10 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & -3 & 8 \\ -3 & -9 & -1 \\ -8 & 2 & 3 \end{bmatrix}$. Compute $A + B$.
3. Let $A = \begin{bmatrix} 8 & -3 & -2 \\ 6 & -7 & 6 \\ 4 & 7 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -9 & 4 \\ 7 & 6 & -6 \\ -3 & -1 & -1 \end{bmatrix}$. Compute $A + B$.

4. Let $A = \begin{bmatrix} -1 & -6 & 5 \\ 8 & -1 & 4 \\ 3 & -7 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & -2 \\ 3 & 9 & 6 \\ -8 & 5 & 9 \end{bmatrix}$. Compute $A + B$.
5. Let $A = \begin{bmatrix} 1 & -1 & -1 \\ -10 & 2 & 1 \\ -4 & 5 & -10 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 5 & -9 \\ 5 & 3 & 6 \\ 2 & 3 & 3 \end{bmatrix}$. Compute $A + B$.
6. Let $A = \begin{bmatrix} -6 & -2 & -5 \\ -9 & 3 & 0 \\ 1 & 9 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -4 & 0 \\ -3 & 8 & 0 \\ 4 & 7 & 8 \end{bmatrix}$. Compute $A + B$.
7. Let $A = \begin{bmatrix} -7 & 8 & -10 \\ 1 & 0 & -9 \\ 4 & -1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -8 & -6 \\ 3 & -8 & -5 \\ 9 & 0 & 5 \end{bmatrix}$. Compute $A + B$.
8. Let $A = \begin{bmatrix} 2 & -6 & 8 \\ 8 & 5 & -3 \\ 4 & -3 & -9 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -6 & -6 \\ 9 & 7 & 3 \\ -2 & 6 & -3 \end{bmatrix}$. Compute $A + B$.
9. Let $A = \begin{bmatrix} 0 & -4 & 1 \\ 9 & 2 & 8 \\ 7 & 3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -10 & 5 & -10 \\ -5 & 0 & 7 \\ -4 & 1 & -3 \end{bmatrix}$. Compute $A + B$.
10. Let $A = \begin{bmatrix} 6 & 0 & 0 \\ -4 & -3 & -7 \\ 6 & -1 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} -10 & 7 & -8 \\ 0 & 3 & -1 \\ 0 & -10 & 9 \end{bmatrix}$. Compute $A + B$.

2.2.2. Subtraction

1. Let $A = \begin{bmatrix} -1 & -2 & 2 \\ 4 & 1 & -9 \\ -8 & 2 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 9 & -6 \\ 3 & 1 & 7 \\ 3 & 8 & -9 \end{bmatrix}$. Compute $A - B$.
2. Let $A = \begin{bmatrix} -6 & 3 & -7 \\ 5 & -4 & 9 \\ 2 & 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & 8 & -9 \\ -2 & -1 & -10 \\ -7 & -1 & 9 \end{bmatrix}$. Compute $A - B$.
3. Let $A = \begin{bmatrix} 3 & -2 & 6 \\ 0 & -7 & -7 \\ 6 & -9 & -8 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -5 & 0 \\ -3 & -8 & -2 \\ -4 & -2 & -3 \end{bmatrix}$. Compute $A - B$.
4. Let $A = \begin{bmatrix} -1 & 1 & 2 \\ 9 & 3 & -7 \\ 5 & 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} -10 & -4 & -7 \\ 7 & 9 & 3 \\ 9 & -8 & 7 \end{bmatrix}$. Compute $A - B$.
5. Let $A = \begin{bmatrix} -9 & -9 & 9 \\ -1 & 3 & -5 \\ 6 & 2 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} -9 & 9 & 3 \\ 2 & -8 & 6 \\ -5 & -8 & 4 \end{bmatrix}$. Compute $A - B$.
6. Let $A = \begin{bmatrix} -1 & 2 & -9 \\ 9 & 7 & -6 \\ -6 & -9 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 & -5 \\ 3 & -5 & -10 \\ 0 & -3 & 5 \end{bmatrix}$. Compute $A - B$.
7. Let $A = \begin{bmatrix} -4 & 3 & 5 \\ 8 & -7 & 2 \\ -9 & -5 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 & 2 \\ 1 & 4 & 9 \\ -10 & 3 & -10 \end{bmatrix}$. Compute $A - B$.
8. Let $A = \begin{bmatrix} -5 & -2 & -4 \\ -7 & -7 & -4 \\ 7 & -1 & -8 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & -4 & 4 \\ 2 & 5 & -2 \\ -4 & -3 & 0 \end{bmatrix}$. Compute $A - B$.
9. Let $A = \begin{bmatrix} -9 & -6 & -8 \\ -9 & 4 & -9 \\ 5 & 8 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & -6 & 8 \\ -7 & -10 & -3 \\ -2 & 0 & 5 \end{bmatrix}$. Compute $A - B$.
10. Let $A = \begin{bmatrix} 4 & 5 & 7 \\ -5 & 5 & -1 \\ -7 & 6 & -8 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -7 & -5 \\ -5 & 4 & 1 \\ 9 & 4 & -8 \end{bmatrix}$. Compute $A - B$.

2.2.3. Multiplication

1. Let $A = \begin{bmatrix} 7 & -10 & -5 \\ 4 & -4 & 7 \\ -10 & 5 & -9 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 & -7 \\ -3 & -9 & 7 \\ -3 & -2 & -1 \end{bmatrix}$. Compute $A \cdot B$.
2. Let $A = \begin{bmatrix} 9 & 8 & -8 \\ -9 & 4 & 7 \\ -1 & 2 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 & 4 \\ 5 & 2 & 5 \\ 4 & 8 & -2 \end{bmatrix}$. Compute $A \cdot B$.
3. Let $A = \begin{bmatrix} -7 & 3 & -7 \\ -3 & 0 & -3 \\ 4 & 4 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & -3 & 7 \\ 2 & 6 & 4 \\ -1 & -3 & -8 \end{bmatrix}$. Compute $A \cdot B$.
4. Let $A = \begin{bmatrix} -3 & -2 & 3 \\ 0 & 0 & -4 \\ -6 & -5 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & -9 & 8 \\ 9 & -7 & -5 \\ -6 & 8 & 9 \end{bmatrix}$. Compute $A \cdot B$.
5. Let $A = \begin{bmatrix} 6 & 6 & -3 \\ 1 & 2 & -5 \\ -4 & -6 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -5 & 6 \\ -1 & -5 & 3 \\ 1 & -5 & 4 \end{bmatrix}$. Compute $A \cdot B$.
6. Let $A = \begin{bmatrix} 1 & 7 & -2 \\ -5 & -3 & -7 \\ 4 & 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -7 & 8 \\ 1 & -3 & -4 \\ -3 & -8 & -9 \end{bmatrix}$. Compute $A \cdot B$.
7. Let $A = \begin{bmatrix} -5 & -5 & 8 \\ 3 & -7 & -7 \\ -9 & -10 & -8 \end{bmatrix}$ and $B = \begin{bmatrix} -5 & -5 & 6 \\ -5 & 4 & 1 \\ 4 & -4 & -8 \end{bmatrix}$. Compute $A \cdot B$.
8. Let $A = \begin{bmatrix} -7 & 5 & 8 \\ -1 & -7 & -6 \\ -4 & -5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -6 & -10 & -2 \\ 5 & -5 & -3 \\ -6 & -8 & -9 \end{bmatrix}$. Compute $A \cdot B$.
9. Let $A = \begin{bmatrix} -9 & 8 & -9 \\ 7 & 6 & -2 \\ -9 & -7 & -6 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -3 & -8 \\ 0 & 2 & 2 \\ 1 & 7 & -5 \end{bmatrix}$. Compute $A \cdot B$.
10. Let $A = \begin{bmatrix} -1 & 8 & -10 \\ 5 & 4 & 7 \\ -5 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -8 & 1 & -10 \\ -5 & -5 & 6 \\ -1 & -3 & -9 \end{bmatrix}$. Compute $A \cdot B$.

3. Answer

3.1. Vector Arithmetic

3.1.1. Addition

1: $\begin{bmatrix} 3 \\ 5 \\ -1 \end{bmatrix}$ 2: $\begin{bmatrix} -15 \\ -13 \\ -15 \end{bmatrix}$ 3: $\begin{bmatrix} 18 \\ 7 \\ 9 \end{bmatrix}$ 4: $\begin{bmatrix} 3 \\ 1 \\ -5 \end{bmatrix}$ 5: $\begin{bmatrix} -5 \\ -5 \\ -9 \end{bmatrix}$

6: $\begin{bmatrix} -5 \\ 9 \\ -19 \end{bmatrix}$ 7: $\begin{bmatrix} -16 \\ 7 \\ 4 \end{bmatrix}$ 8: $\begin{bmatrix} 17 \\ -3 \\ -1 \end{bmatrix}$ 9: $\begin{bmatrix} -6 \\ 3 \\ 10 \end{bmatrix}$ 10: $\begin{bmatrix} 0 \\ -8 \\ 2 \end{bmatrix}$

3.1.2. Subtraction

1: $\begin{bmatrix} -3 \\ -11 \\ 14 \end{bmatrix}$ 2: $\begin{bmatrix} 9 \\ 8 \\ -7 \end{bmatrix}$ 3: $\begin{bmatrix} -14 \\ 10 \\ -9 \end{bmatrix}$ 4: $\begin{bmatrix} 8 \\ 7 \\ 6 \end{bmatrix}$ 5: $\begin{bmatrix} -3 \\ -12 \\ 12 \end{bmatrix}$

6: $\begin{bmatrix} -1 \\ -2 \\ -10 \end{bmatrix}$ 7: $\begin{bmatrix} -4 \\ -12 \\ 10 \end{bmatrix}$ 8: $\begin{bmatrix} 13 \\ -8 \\ 5 \end{bmatrix}$ 9: $\begin{bmatrix} 6 \\ 9 \\ -3 \end{bmatrix}$ 10: $\begin{bmatrix} -8 \\ -13 \\ 10 \end{bmatrix}$

3.1.3. Scalar Multiplication

1: $\begin{bmatrix} -10 \\ -2 \\ 16 \end{bmatrix}$ 2: $\begin{bmatrix} -35 \\ 25 \\ -50 \end{bmatrix}$ 3: $\begin{bmatrix} 3 \\ -5 \\ -6 \end{bmatrix}$ 4: $\begin{bmatrix} -16 \\ -4 \\ -24 \end{bmatrix}$ 5: $\begin{bmatrix} -27 \\ 9 \\ -36 \end{bmatrix}$

6: $\begin{bmatrix} -36 \\ -4 \\ -24 \end{bmatrix}$ 7: $\begin{bmatrix} -21 \\ -35 \\ 35 \end{bmatrix}$ 8: $\begin{bmatrix} -18 \\ -54 \\ 18 \end{bmatrix}$ 9: $\begin{bmatrix} 2 \\ -4 \\ 0 \end{bmatrix}$ 10: $\begin{bmatrix} 80 \\ -8 \\ -16 \end{bmatrix}$

3.2. Matrix Arithmetic

3.2.1. Addition

1: $\begin{bmatrix} -1 & -2 & 2 \\ 10 & -15 & -14 \\ 3 & -20 & -17 \end{bmatrix}$ 2: $\begin{bmatrix} 4 & -13 & 3 \\ -1 & -18 & 3 \\ -11 & -8 & 4 \end{bmatrix}$ 3: $\begin{bmatrix} 12 & -12 & 2 \\ 13 & -1 & 0 \\ 1 & 6 & 5 \end{bmatrix}$ 4: $\begin{bmatrix} 0 & -3 & 3 \\ 11 & 8 & 10 \\ -5 & -2 & 6 \end{bmatrix}$ 5: $\begin{bmatrix} -3 & 4 & -10 \\ -5 & 5 & 7 \\ -2 & 8 & -7 \end{bmatrix}$

6: $\begin{bmatrix} -5 & -6 & -5 \\ -12 & 11 & 0 \\ 5 & 16 & 6 \end{bmatrix}$ 7: $\begin{bmatrix} -6 & 0 & -16 \\ 4 & -8 & -14 \\ 13 & -1 & 4 \end{bmatrix}$ 8: $\begin{bmatrix} 4 & -12 & 2 \\ 17 & 12 & 0 \\ 2 & 3 & -12 \end{bmatrix}$ 9: $\begin{bmatrix} -10 & 1 & -9 \\ 4 & 2 & 15 \\ 3 & 4 & 2 \end{bmatrix}$ 10: $\begin{bmatrix} -4 & 7 & -8 \\ -4 & 0 & -8 \\ 6 & -11 & 18 \end{bmatrix}$

3.2.2. Subtraction

1: $\begin{bmatrix} -10 & -11 & 8 \\ 1 & 0 & -16 \\ -11 & -6 & 16 \end{bmatrix}$ 2: $\begin{bmatrix} -14 & -5 & 2 \\ 7 & -3 & 19 \\ 9 & 7 & -2 \end{bmatrix}$ 3: $\begin{bmatrix} 4 & 3 & 6 \\ 3 & 1 & -5 \\ 10 & -7 & -5 \end{bmatrix}$ 4: $\begin{bmatrix} 9 & 5 & 9 \\ 2 & -6 & -10 \\ -4 & 14 & 0 \end{bmatrix}$ 5: $\begin{bmatrix} 0 & -18 & 6 \\ -3 & 11 & -11 \\ 11 & 10 & -9 \end{bmatrix}$

6: $\begin{bmatrix} 0 & -1 & -4 \\ 6 & 12 & 4 \\ -6 & -6 & -1 \end{bmatrix}$ 7: $\begin{bmatrix} -4 & 3 & 3 \\ 7 & -11 & -7 \\ 1 & -8 & 8 \end{bmatrix}$ 8: $\begin{bmatrix} -13 & 2 & -8 \\ -9 & -12 & -2 \\ 11 & 2 & -8 \end{bmatrix}$ 9: $\begin{bmatrix} -6 & 0 & -16 \\ -2 & 14 & -6 \\ 7 & 8 & -7 \end{bmatrix}$ 10: $\begin{bmatrix} 0 & 12 & 12 \\ 0 & 1 & -2 \\ -16 & 2 & 0 \end{bmatrix}$

3.2.3. Multiplication

1: $\begin{bmatrix} 45 & 93 & -114 \\ -9 & 18 & -63 \\ 12 & -17 & 114 \end{bmatrix}$ 2: $\begin{bmatrix} -19 & -30 & 92 \\ 75 & 46 & -30 \\ -7 & -38 & 16 \end{bmatrix}$ 3: $\begin{bmatrix} -36 & 60 & 19 \\ -18 & 18 & 3 \\ 40 & 24 & 76 \end{bmatrix}$ 4: $\begin{bmatrix} -24 & 65 & 13 \\ 24 & -32 & -36 \\ -45 & 121 & 13 \end{bmatrix}$ 5: $\begin{bmatrix} 27 & -45 & 42 \\ -1 & 10 & -8 \\ -13 & 25 & -22 \end{bmatrix}$

6: $\begin{bmatrix} 12 & -12 & -2 \\ 23 & 100 & 35 \\ -24 & -87 & -35 \end{bmatrix}$ 7: $\begin{bmatrix} 82 & -27 & -99 \\ -8 & -15 & 67 \\ 63 & 37 & 0 \end{bmatrix}$ 8: $\begin{bmatrix} 19 & -19 & -73 \\ 7 & 93 & 77 \\ -7 & 57 & 14 \end{bmatrix}$ 9: $\begin{bmatrix} -9 & -20 & 133 \\ -2 & -23 & -34 \\ -6 & -29 & 88 \end{bmatrix}$ 10: $\begin{bmatrix} -22 & -11 & 148 \\ -67 & -36 & -89 \\ 40 & -15 & -1 \end{bmatrix}$