Mathematical Exercise

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

2.1.2. Subtraction

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

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

2.1.3. Scalar Multiplication

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

2.2. Matrix Arithmetic

2.2.1. Addition

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

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

2.2.2. Subtraction

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

2.2.3. Multiplication

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

3. Answer

3.1. Vector Arithmetic

3.1.1. Addition

1: $\begin{bmatrix} -5 \\ 4 \\ 7 \end{bmatrix}$ 2: $\begin{bmatrix} 5 \\ 1 \\ -14 \end{bmatrix}$ 3: $\begin{bmatrix} -11 \\ 2 \\ -12 \end{bmatrix}$ 4: $\begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix}$ 5: $\begin{bmatrix} -13 \\ -1 \\ -8 \end{bmatrix}$

6: $\begin{bmatrix} 13 \\ -10 \\ 9 \end{bmatrix}$ 7: $\begin{bmatrix} -1 \\ -12 \\ -1 \end{bmatrix}$ 8: $\begin{bmatrix} 1 \\ -5 \\ 2 \end{bmatrix}$ 9: $\begin{bmatrix} 5 \\ 0 \\ 15 \end{bmatrix}$ 10: $\begin{bmatrix} 5 \\ -11 \\ 4 \end{bmatrix}$

3.1.2. Subtraction

1: $\begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix}$ 2: $\begin{bmatrix} 12 \\ -5 \\ 2 \end{bmatrix}$ 3: $\begin{bmatrix} 0 \\ 9 \\ 12 \end{bmatrix}$ 4: $\begin{bmatrix} -2 \\ -2 \\ -10 \end{bmatrix}$ 5: $\begin{bmatrix} -12 \\ 2 \\ -15 \end{bmatrix}$

6: $\begin{bmatrix} -15 \\ 11 \\ 0 \end{bmatrix}$ 7: $\begin{bmatrix} 4 \\ -6 \\ 1 \end{bmatrix}$ 8: $\begin{bmatrix} 0 \\ 4 \\ 12 \end{bmatrix}$ 9: $\begin{bmatrix} -5 \\ -6 \\ 3 \end{bmatrix}$ 10: $\begin{bmatrix} 3 \\ -10 \\ -8 \end{bmatrix}$

3.1.3. Scalar Multiplication

1: $\begin{bmatrix} 72 \\ 9 \\ -72 \end{bmatrix}$ 2: $\begin{bmatrix} -6 \\ -24 \\ 18 \end{bmatrix}$ 3: $\begin{bmatrix} 0 \\ -70 \\ 100 \end{bmatrix}$ 4: $\begin{bmatrix} -54 \\ 12 \\ 0 \end{bmatrix}$ 5: $\begin{bmatrix} -36 \\ 60 \\ -30 \end{bmatrix}$

6: $\begin{bmatrix} 24 \\ 0 \\ 54 \end{bmatrix}$ 7: $\begin{bmatrix} -32 \\ 48 \\ -24 \end{bmatrix}$ 8: $\begin{bmatrix} 24 \\ -32 \\ -56 \end{bmatrix}$ 9: $\begin{bmatrix} -90 \\ -54 \\ 81 \end{bmatrix}$ 10: $\begin{bmatrix} 25 \\ 20 \\ 5 \end{bmatrix}$

3.2. Matrix Arithmetic

3.2.1. Addition

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

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

3.2.2. Subtraction

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

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

3.2.3. Multiplication

1: $\begin{bmatrix} 45 & -28 & -22 \\ 109 & -8 & -48 \\ 23 & -6 & 0 \end{bmatrix}$ 2: $\begin{bmatrix} 49 & -3 & 48 \\ -23 & -17 & 47 \\ -43 & -13 & 8 \end{bmatrix}$ 3: $\begin{bmatrix} -14 & 9 & -13 \\ -94 & -26 & 38 \\ 3 & 24 & -70 \end{bmatrix}$ 4: $\begin{bmatrix} -138 & 7 & -62 \\ 38 & 13 & 39 \\ 6 & -11 & 25 \end{bmatrix}$ 5: $\begin{bmatrix} -23 & -20 & -10 \\ -54 & -49 & 31 \\ 20 & 129 & 114 \end{bmatrix}$

6: $\begin{bmatrix} 35 & 90 & -52 \\ 13 & 30 & -8 \\ -42 & 8 & 2 \end{bmatrix}$ 7: $\begin{bmatrix} -24 & 8 & -63 \\ -108 & -76 & -55 \\ -59 & -20 & -67 \end{bmatrix}$ 8: $\begin{bmatrix} 65 & -72 & 48 \\ 75 & 18 & 28 \\ -6 & -28 & -92 \end{bmatrix}$ 9: $\begin{bmatrix} -87 & 9 & 47 \\ 22 & 3 & -43 \\ 30 & -67 & 81 \end{bmatrix}$ 10: $\begin{bmatrix} 140 & -16 & 44 \\ -126 & 34 & 30 \\ -22 & 9 & -17 \end{bmatrix}$