

**Math 224**  
**Class Session 2**  
**August 30, 2007**  
**In-class Maple Exercises**

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1. Let  $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ 0 & 4 \\ -1 & -2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ . Evaluate  $A \cdot B$ .
2. Evaluate  $B \cdot A$ . What happened?
3.  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & 1 \\ 3 & -2 \end{bmatrix}$ . Evaluate  $A \cdot B$  and  $B \cdot A$ . Is matrix multiplication commutative?
4. Evaluate  $2 \cdot B$ , where  $B = \begin{bmatrix} 5 & 1 \\ 3 & -2 \end{bmatrix}$ .
5. Let  $I_2$  denote the  $2 \times 2$  identity matrix. Create  $I_2$  in Maple. Evaluate  $I_2 \cdot B$  and  $B \cdot I_2$ , where  $B = \begin{bmatrix} 5 & 1 \\ 3 & -2 \end{bmatrix}$ .
6. Let  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ -7 & 22 & -405 \end{bmatrix}$ , and let  $I_3$  denote the  $3 \times 3$  identity matrix. Evaluate  $I_3 \cdot A$  and  $A \cdot I_3$ .
7. What is your conjecture about the identity matrix based on the numerical results of the previous two exercises and your (perhaps algebraic) intuition about the word *identity*?
8. Find the transpose of the matrix  $A$  (as defined above) in Maple.
9. Solve the following linear system in Maple.

$$\begin{aligned} 2x + y - 3z &= 0 \\ 6x + 3y - 8z &= 0 \\ 2x - y + 5z &= -4 \end{aligned}$$

10. Solve the following linear system in Maple.

$$\begin{aligned} 2x + 6y - z &= 8 \\ 3x + 9y &= 15 \\ 2x - 5y + 6z &= 1 \end{aligned}$$

11. Solve the following linear system in Maple.

$$\begin{aligned}x + y + z &= 1 \\4x + 3y + 5z &= 7 \\2x + y + 3z &= 6\end{aligned}$$

12. Solve the following linear system in Maple.

$$\begin{aligned}x + 2y - 3z + w &= 2 \\3x + 6y - 8z - 2w &= 1\end{aligned}$$

13. Let  $E$  denote the elementary matrix  $E = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ . How is  $E$  obtained from the  $3 \times 3$  identity matrix? Let  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ . Evaluate  $E \cdot A$ . How is the result related to  $A$ ?

14. Let  $B = \begin{bmatrix} -7 & 5 \\ 4 & 1 \\ 0 & 26 \end{bmatrix}$ . Evaluate  $E \cdot B$ . How is the result related to  $B$ ? What is your conjecture about multiplication the left by elementary matrices?