Name: **Section:**

Computer Science 243
Spring 2025
Homework 6

Due: beginning of class, Wednesday, 3/19/25 **Points: 50**

Answer the following questions and show your work. Your final submission must be completely your own work.

1. [12 points] Let $A = \{x \in \boldsymbol{R} \mid -1 \leq x \leq 1\}$ and $B = \boldsymbol{N}$. For each of the following, list the set and state if it is finite, countably infinite, or uncountable.

   a. A
   b. $A \cap B$
   c. $A - B$
   d. $B - A$
   e. $B \cup Z^-$
   f. $A \cap \overline{A}$

2. [8 points] Using the following matrices, compute the matrix operations below:

$$\mathbf{A} = \begin{bmatrix} 1 & -2 & 0 \\ 3 & 2 & 1 \\ 2 & 0 & -1 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 2 & 0 & 1 \\ 2 & -3 & 0 \\ -1 & 0 & -1 \end{bmatrix}$$

   a. [2 points] **A + B**
   b. [3 points] **AB**
   c. [3 points] **BA**

3. [14 points] Answer the following using the 0-1 matrices below.

$$\mathbf{A} = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

   a. $\mathbf{B^t}$
   b. Is **A** symmetric? Is **B** symmetric?
   c. $\mathbf{A} \vee \mathbf{B}$
   d. $\mathbf{A} \wedge \mathbf{B}$
   e. $\mathbf{A} \odot \mathbf{B}$
   f. $\mathbf{B} \odot \mathbf{A}$
   g. $\mathbf{A}^{[3]}$

4. [16 points] Consider the following functions:

$f_1(n) = 6n^{3/2}$
$f_2(n) = 64$
$f_3(n) = 2n^2 + n^3 \log n$
$f_4(n) = 3n \log n$
$f_5(n) = 6\sqrt{n}$
$f_6(n) = 4n^5 - 7n^4$
$f_7(n) = n + 2 \log n$
$f_8(n) = 16n^2$

   a. For each function, find the tightest big-O bound.

   b. Order the functions from slowest growing to fastest growing (you need only list them by function name, e.g., f_2).