Math 141 Key Topics: 2.4-2.7

Section 2.4

- A matrix with m rows and n columns has size $m \times n$. a_{ij} is the entry in the ith row and jth column of the matrix.
- In order to add or subtract matrices, they must have the same size. To multiply a matrix by a scalar, multiply each entry by this scalar.
- The **transpose** of a matrix A, denoted A^T, is found by making all the rows of A the columns of A^T. (Just interchange rows and columns.)

Section 2.5

- In order for the matrix multiplication AB to make sense, the number of columns of A must equal the number of rows of B. In other words, if A has size $m \times n$ and B has size $r \times s$, then n must equal r. Then, the resulting product matrix will have size $m \times s$.
- To multiply AB by hand, move across the rows of A as you move down the columns of B.
- Matrix multiplication is not commutative: $\mathrm{AB} \neq \mathrm{BA}$.
- An identity matrix I_n has 1's along the diagonal and 0's everywhere else.
- A system of equations can be written as a matrix equation AX=B.

Section 2.6

- The inverse of a matrix A, denoted A^{-1}, is the matrix such that $\mathrm{AA}^{-1}=\mathrm{A}^{-1}\mathrm{A}=\mathrm{I}_n$.
- Not all matrices have inverses. Those that have inverses are called **nonsingular**. Those that do NOT have inverses are called **singular**.
- The solution to the matrix equation AX=B is $\mathrm{X}=\mathrm{A}^{-1}\mathrm{B}$, if A has an inverse.

Section 2.7

- Leontief Input-Output models involve 3 matrices:
  - A – This is the **input-output matrix**. It tells you how much input or consumption is required to produce 1 unit of output.
  - X – This is the **gross production matrix**. It gives the total output of the economy.
  - D – This is the consumer demand matrix.
- AX is the **internal consumption matrix**. It tells you how much was consumed in the internal process of production in order to meet the gross output.
- $X - AX = D$. (total output - internal consumption = consumer demand). The solution to this matrix equation is $X = (I - A)^{-1}D$.