Units 10, 11 Algorithms

1. Consider the following transportation network connecting locations in a town, where each road has an associated travel cost (in dollars). Your job is to establish a travel route from **Home** to **Castle** with the minimum cost, where the total cost is determined by the sum of costs along that path. *You need to show how algorithm works step by step*.



- 2. Sort the following functions in the ascending order (slowest-growth first); put equal signs when several terms are equal. For example, A, B=C, D. Note that there are 12 terms.
 - No explanation needed.

$$\begin{split} \Theta(\log n), \Theta(1), \Theta\left(\frac{n}{\log n}\right), \Theta(n), \Theta\left(\frac{\sqrt{n^2+1}}{\sqrt{n}}\right), \Theta(\sqrt{n}), \Theta(n^2), \Theta((\log n)^2), \\ \Theta(n+\log n), \Theta(\log(n^2)) \end{split}$$

3. Use the matrix-chain multiplication algorithm to determine the optimal parameterization for multiplying the following four matrices $(A_1A_2A_3A_4)$ in a way that minimizes the number of scalar multiplications. Also, find the minimum number of scalar multiplications required.

Given Matrices:

- $A_1: 8 \times 5$
- $A_2: 5 \times 2$
- $A_3: 2 \times 6$
- $A_4: 6 \times 3$