

1. Problem 1: The Closet Mayhem Problem

- (A) The graph G can be described as a directed graph with vertices V where $v_i \in V$ is the i th handhold. $\{v, w\}$ where $v, w \in V$ is defined as a directional edge from v to w if and only if there is a path from the handholds corresponding to v and w .

We identified the goal of the problem to be to find the longest path in the DAG, therefore we are going to use the solution to Homework 1 Problem 2 Part D. To summarize though, first make the end position a sink by adding edges from any other sinks to the ending node making graph G' . Perform a Topological Sort on the new graph G' and create a list with count of nodes on the best path to the end from the current node. We then iterate through the list n times, where n is the number of nodes/handholds. Since we want to get the most points possible by going to as many nodes as possible. As a result the running time is $O(n + m)$.

- (B) Compute the meta-graph for the given graph which runs in $O(n + m)$ time. Let the weight of each node in the meta-graph correspond to the number of nodes in the cycle that the node represents. Then run the algorithm from Part A.