1. Problems from the text (Chapter 3): Most of the exercise problems in Chapter 3 in the text are interesting and should be solved. The problems that are designated as practice problems are: 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 16, 18, 22, 24, 26, 27, 29.

2. Suppose that we are given a set of depth first intervals of the nodes of a graph $G$ as follows:

   $v[1] : [5, 8],$
   $v[2] : [14, 15],$
   $v[3] : [9, 10],$
   $v[4] : [2, 3],$
   $v[5] : [4, 11],$
   $v[6] : [1, 12],$
   $v[7] : [6, 7],$
   $v[8] : [13, 16]$

Answer the following queries for graph $G$.

   (a) What are the descendant and ancestor nodes of $v[5]$ in $G$?
   (b) How many components are there in $G$?
   (c) Identify a pair of nodes in a connected component of $G$ which are not related (i.e. one is neither descendant nor ancestor of other).
   (d) Construct the depth first tree of $G$ which realizes the dfs intervals as given.
   (e) Just add one edge to $G$ which will guarantee that $G$ is not an acyclic graph.
   (f) Remove one node from $G$ such that the number of connected components remains the same. (Note that $G$ may have many edges which we are not aware of.)

3. An ascending sorted sequence of distinct values is one in which some form of a less than operator is used to order the elements from smallest to largest. For example, the sorted sequence $A, B, C, D$ implies that $A < B$, $B < C$, and $C < D$. In this problem you will be given a set of relations of the form $A < B$ and ask you to determine whether a sorted order has been specified or not.
4. **Pushing Boxes UVA 589** We are interested in checking whether there is a sequence of pushes which will bring the box at the starting place to the target cell. Can you solve this problem by creating a graph first and then apply dfs?

5. **A knight’s Journey** Given an $A \times B$ rectangular board and the starting position of the knight, determine whether the knight can visit every square of the board.

![Figure 11.11](image.png)

**Figure 11.11** Eight possible moves of a knight.

6. **Other interesting UVA problems involving graph traversals**
   - UVA 10067 Playing with wheels
   - UVA 10051 Tower of cubes