Homework Assignment #9
Due: Monday, April 2 at 2:30 p.m.

Both of the following questions can be answered by constructing a graph and then using the graph algorithms from the textbook. This means that no sophisticated algorithms need to be designed, but when you describe the construction of the graph, you should precisely specify:

- is it directed or undirected,

- the set of nodes,

- whether each pair of nodes is connected by an edge or not,

- weights on edges (if any),

- any other important details (such as the number of nodes or edges in your graph, which may be useful for bounding the running time of your algorithm).

1. You are given a few random pages from a dictionary for a foreign language. Words are listed on each page in alphabetical order, but you don't know what order the pages go in. The language uses an alphabet that you are not familiar with. For instance, the first two words on the page are:
бечета
библиография
From this, you can conclude that е precedes и in the language's alphabet. You would like to construct an ordering of the letters in the alphabet that is consistent with all of the pages of the dictionary that you have. (This ordering might not be unique). There are n pages with w words on each page.

2. You have a map of the highway network across Canada. It includes n cities and the lengths of the m highway segments that form direct connections between pairs of cities.

    You have decided to drive from Toronto to Vancouver during your summer vacation. You have a bucket list of Canadian cities that you have always wanted to visit. For example, you have always wanted to visit Medicine Hat. You decide that you will design your route so that you visit *at least k* of the cities on your list along the way from Toronto to Vancouver. However, your vacation time and gasoline budget is limited, so you want to take the *shortest* path from Toronto to Vancouver that passes through at least k of your list.

    (The running time of your algorithm should be polynomial in n, m and k.)