Problem Set 7

Due dates: Electronic submission of this homework is due on **3/21/2014 before 11:00am** on ecampus, a signed paper copy of the pdf file is due on **3/21/2014** at the beginning of class.

Name: (put your name here)

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: _____

BFS

Problem 1. (10 points) Exercise 22.2-6 on page 602.

Solution.

Problem 2. (20 points) (a) Exercise 22.2-8 on page 602.
(b) Prove that your algorithm returns the correct result.

Solution.

DFS

Problem 3. (15 points) Exercise 22.3-5 on page 611.

Solution.

Problem 4. (15 points) Exercise 22.3-8 on page 611.

Solution.

Problem 5. (20 points) Prove that a directed graph G has a cycle if and only if DFS(G) reveals a back edge. [You can use this property to make DFS-based topological sorting robust against common user errors.]

Solution.

Problem 6. In a Futoshiki puzzle, the player is given an $n \times n$ board of square cells. The cells are either blank (denoted by a dot) or contain an integer in the range from 1 to n. Additionally, inequalities between some adjacent cells might be given as additional clues. The objective is to recover an $n \times n$ Latin square that contains each number from 1 to n in each row and in each column from the given clues. An example of a futoshiki puzzle is given below:

```
. | . | . | . | .
- - - - v - - - -
. > . | . | . | 3
- - - - - - - - -
. | . < 2 | . | .
- - - - v - - - -
. | . | . | . | 4
^ - v - - - - - -
. | . | . | . | .
```

(a) Write a concise program in C, C++, Python, or Ruby that solve a Futoshiki puzzle using backtracking (that is, it enumerates putative partial solutions by successively filling the first row, then the second row, and so on of the puzzle in a depth-first fashion).
(b) Give a clear description of your program.
(c) Include the solution to your challenge problems that will be posted.

Discussions on ecampus are always encouraged, especially to clarify concepts that were introduced in the lecture. However, discussions of homework problems on piazza should not contain spoilers. It is okay to ask for clarifications concerning homework questions if needed.

Checklist:
- ☐ Did you add your name?
- ☐ Did you disclose all resources that you have used?
  (This includes all people, books, websites, etc. that you have consulted)
- ☐ Did you sign that you followed the Aggie honor code?
- ☐ Did you solve all problems?
- ☐ Did you submit (a) your latex source file and (b) the resulting pdf file of your homework?
- ☐ Did you submit (c) a hardcopy of the pdf file in class?