CS 302 Computer Fluency
Algorithms, Networks and Security

1. Suppose that you are given the following sorted list of numbers:

   3, 7, 21, 26, 35, 41, 43, 45, 54, 58, 62, 67, 71, 77, 80, 82, 91, 95

   a. Show the order in which you will check the elements of this list if you are using sequential search to look for 80.
   b. Show the order in which you will check the elements of this list if you are using binary search to look for 80.
   c. Give an example of a number that you would find faster if you used sequential search.

2. Give two examples of everyday heuristics that you use.

3. Facebook uses a heuristic search algorithm to find the things to show on your home page. Just from watching what you get, can you think of factors that contribute to the objective function that it uses? (If you've never gotten on Facebook, ask some friends to help you on this.)

4. Take your slider puzzle. Randomly make at least 20 moves so that you have the tiles mixed up.
   a. Show the puzzle at this point. You can take a picture of it or sketch it.
   b. Now solve it. How many moves did it take you to do so?

5. In class I presented the following program for computing the 3n+1 function:

```
def threen(value):
    # compute 3n+1
    while value != 1:
        if value % 2 == 0:
            value = value//2
        else:
            value = 3 * value + 1
        print(int(value))
```
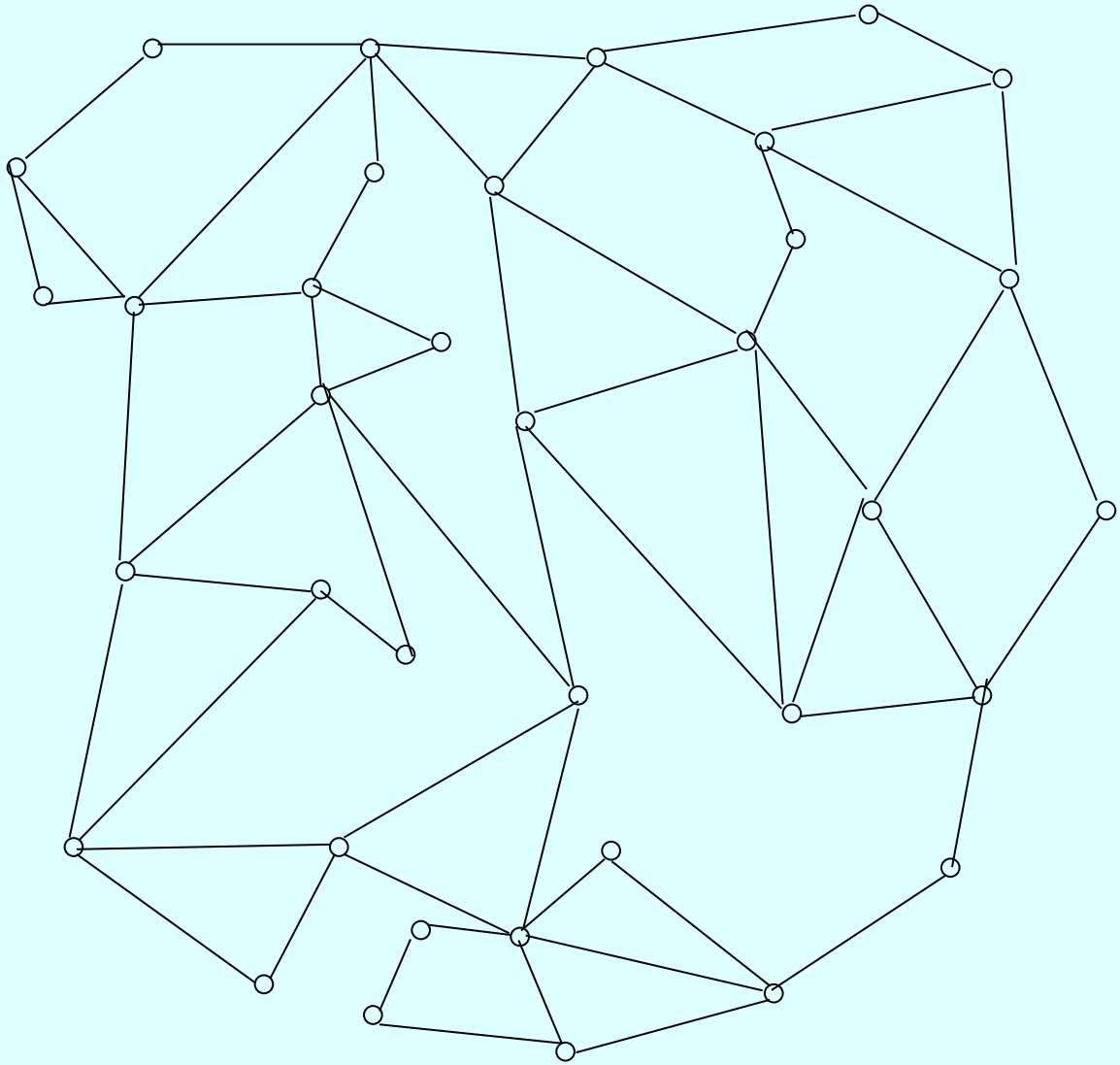
   Run it on 87. How many steps did it take to converge?

6. Consider the following nim game:

   Assume that you are to play next. Show at least one move that will guarantee a win for you (assuming you don't blow it later).
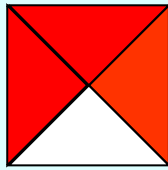
7. Consider the following graph. Does it contain an Eulerian circuit? Justify your answer.
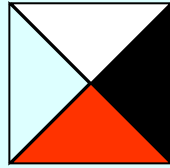
8. Consider the following instance of the Post Correspondence problem. Does it have a solution? If so, show one.

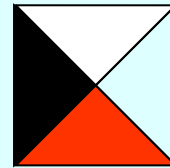| i	X	Y
1	ab	a
2	ab	ba
3	aa	baa

9. Can the following tile set tile an arbitrary surface on the plane (following the rules described in class)?

1   2   3

10. In class I presented my simple, not very robust version of the average program:

```
def average(numbers):
    sum = 0
    for num in numbers:
        sum = sum + num

    return(sum/len(numbers))
```

Type it in to IDLE. Play with it. Give an example of an input that caused an error.

11. Do a websearch on your name. What do you find? If you narrow down the search using Boolean operators (to eliminate most of the matches, if, for example, you were my niece and your name happened to be Jennifer Lopez), do you get any closer to yourself?

12. What's the ip address that is assigned right now to your computer (or whatever computer you are using as you do this problem)? To answer this, you'll need to look on your computer. On my Windows Vista machine, I got the answer by following:

Control Panel>Network and Internet> Network and Sharing Center.

Then go to connection then View Status> Details. Then look for IPv4 IP Address.

On a Mac, this should work:

System Preferences>Network

Then you should see: "_____ is connected to _____ and has the IP address _____

13. To understand how packet switching works, go to:

http://www.pbs.org/opb/nerds2.0.1/geek_glossary/packet_switching_flash.html

Run the demo all the way through. How is this way of communicating different from what happens when you make a landline phone call?

14. There are many tools that enable you to test the speed of the network that you are using. Here's one:

   http://www.internetfrog.com/mypc/speedtest/

   a. Use this (or some other tool if you have one you're used to using) to determine the speed of at least two different networks that you use. You might want to try it at home, at UT, and/or at a public place like Starbucks. You'll notice that you generally get different speeds for downloads (to your machine) and uploads (from your machine). Show a table that looks like this:

Location	Download Speed	Upload Speed

   b. Why do broadband providers use technology that delivers greater speed on downloads than on uploads?

15. Check out Google trends:

   http://www.google.com/trends

   a. What's the top search right now?

   b. Do you have any clue what all of the ones on the list mean? If there is one where you are clueless, what is it? Check it out.

16. In the context of network security, why is a Trojan horse called a "Trojan horse"?

17. Find an estimate for how much money the creators of the Koobface worm have made from it.

18. Check out something on Snopes. For example, I tried entering, "JFK Marilyn Monroe", and found out something interesting. Give an example of something you found that turned out to be false.

19. Check out privacyrights.org's countof data records breached since 2005. Go here, then scroll to the bottom:

   http://www.privacyrights.org/data-breach#Total

   a. In my slides, the count is 516,975,878, which I got on March 22, 2011. What is it now?
   b. How much has it changed per day since mine was taken?