PSU CS 350 Midterm **Sample** Exam Summer 2010 **Exam Key**

*Before you start, **write your name at the top of each page**. This exam was designed to take you 40 minutes or so; you will be given 70. The exam is open-book open-notes. Enough space should be given for each solution, but if not then indicate this and continue on the back.*

I suggest that you read the entire exam before you start. If you find a problem with the exam, please note it in your answer and answer as best you can. Please show as much of your work as you reasonably can: I cannot give partial credit for your invisible work.

*Note: This is **not the real exam**. It is just an example to give you an idea of what the real exam might look like.*

1. You are given an array a of n integers, and another array b of m integers. The idea is that b is an array of "representative" integers for a. That is, each integer in a is supposedly close to some integer in b (where by "close" we mean as usual that their absolute difference is small).

   (a) *[25 pts]* Give pseudocode for a brute-force algorithm to find the largest distance d from any element in a to its closest element in b. That is,

   $$d = max_{i \in \{1..n\}}(min_{j \in \{1..m\}}(|a[i] - b[j]|))$$

   15]

   To find the maximum minimum distance d from any element in a to an element in b:

   ```
   d ← 0
   for i in 1..n
     e ← |a[i] − b[0]|
     for j in 1..m
       e ← min(e, |a[i] − b[j]|)
     d ← max(d, e)
   return d
   ```

   (b) *[25 pts]* What is the "big-O" worst-case running time of your algorithm?

   6] The inner loop executes m times, and is executed n times, so the worst-case running time is $O(nm)$.