COS126 Exam1 Mini-Test Solutions

1. Short Answer

1. 3.0
2. 6.022e23
3. True.
4. True.
5. False.
6. java Recipe < cookbook.txt
   java Recipe < cookbook.txt > meal.txt
   java Recipe | java HungryThing

2. Doubles, StdIn, Analysis of Algorithms

a) Fill in the trace table:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>bestx</th>
<th>besty</th>
<th>bestDist2</th>
<th>xi</th>
<th>yi</th>
<th>dist2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>5.0</td>
<td>NaN</td>
<td>NaN</td>
<td>pos. inf.</td>
<td>1.0</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>1.0</td>
<td>3.0</td>
<td>4.0</td>
<td></td>
<td></td>
<td>5.0</td>
<td>3.0</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.0</td>
<td>6.0</td>
<td>65.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.0</td>
<td>6.0</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.0</td>
<td>6.0</td>
<td>17.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) What does the program print? **Closest point = (2.0, 6.0)**

c) What kind of input would cause NaN, NaN to print out? **Empty input**

d) In general, what does this program do? **Prints the point read in from standard input that is closest to the point entered on the command-line.**

e) Suppose we read in N points. How many comparisons of dist2 and bestDist2 will the program make? **N comparisons.**
3. Recursion, Debugging (from Spring04, Exam 1, Question 4)

a. 
\[
\text{\textbf{func(3)}} \\
\quad | \\
\quad 2\text{\textbf{func(2)}} + 5\text{\textbf{func(1)}} \\
\quad | \\
\quad 2\text{\textbf{func(1)}} + 5\text{\textbf{func(0)}} \\
\quad | \\
\quad 2\text{\textbf{func(-1)}} + 5\text{\textbf{func(-2)}} \\
\]

b. Change if \( j == 1 \) return 1; to if \( j <= 1 \) return 1;

4. Performance

X. Half a day.

Using the doubling hypothesis, the increase appears to be quadratic. So, when \( N \) increases by 10 (from 10,000 to 100,000) the time increases by 100 (from 8 to 800 minutes). 800 minutes is a little over 13 hours, so the best of the answers is half a day.