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. Arrays, Functions, Analysis of Algorithms

   a) mystery1(a, 5) returns true.
   b) Fill in the trace table to show that mystery2(a, 5) returns the same thing.

<table>
<thead>
<tr>
<th>target</th>
<th>low</th>
<th>high</th>
<th>mid</th>
<th>return value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>true</td>
<td></td>
</tr>
</tbody>
</table>

   c) mystery1(a, 20) and mystery2(a, 20) both return false.
   d) These methods check whether target is an element in the array.
   e) mystery1(a, 32) makes 14 comparisons with the target. (two comparisons each pass through the for loop)
   f) mystery2(a, 32) makes 6 comparisons with the target. (two comparisons each pass through the while loop)
   g) mystery2()
   h) mystery1() does a sequential search through the array elements, so it has possibly N passes through the loop.
   mystery2() halves the search area each pass, so worst case, it makes log N passes through the loop.
3. Recursion, Debugging (from Spring04, Exam 1, Question 4)
   a. func(3) 
      | 
      2*func(2) + 5*func(1) 
      | 
      2*func(1) + 5*func(0) 
      | 
      2*func(-1) + 5*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.