**CS 330 Intro to the Design and Analysis of Algorithms**

Homework 2

**(20 pts)**

1. Rank the following functions by order of growth from the slowest to the fastest:

5n100 + n! – 2, 1000000, 5000n2+n3, 2n + 156788logn, 2n

2. Determine the time complexity of the following code segments. In each case, justify your answer.

1. void printUnorderedPairs(int[] arrayA, int[] arrayB)

{

for (int i = 0; i < arrayA.length; i++) {

for (int j = 0; j < arrayB.length; j++) {

for (int k = 0; k < 100000; k++) {

System.out.println(arrayA[i] + “,”+ arrayB[j]) ;

}

}

}

}

1. void printUnorderedPairs(int[] arrayA, int[] arrayB)

{

for (int i = 0; i < 100000; i++) {

for (int j = 0; j < 100000; j++) {

for (int k = 0; k < 100000; k++) {

System.out.println(arrayA[i] + “,”+ arrayB[j]) ;

}

}

}

}

1. int product(int a, int b) {

int sum = 0;

for (int i = 0; i < b; i++) {

sum += a;

}

return sum;

}

1. int sqSum(int n) {

for (int i = 1; i < n\*n; i++) {

sum += 1;

}

return sum;

}

3. Use the Gale-Shapley algorithm in the text to find a stable matching for the following men and women, given the preference lists shown for each. Do it 2 times. The first time have the men do the choosing. The second time have the women do the choosing.

|  |  |  |  |
| --- | --- | --- | --- |
| Man | Preference list | Woman | Preference list |
| Adam | Eve, Greta, Hannah, Faith | Eve | Ben, Caleb, Dan, Adam |
| Ben | Eve, Faith, Greta, Hannah | Faith | Adam, Ben, Caleb, Dan |
| Caleb | Greta, Eve, Faith, Hannah | Greta | Caleb, Dan, Adam, Ben |
| Dan | Faith, Eve, Hannah, Greta | Hannah | Ben, Dan, Adam, Caleb |

4. Decide whether you think the following statement is true or false. If it is true, give a short explanation. If it is false, give a counterexample.

Consider an instance of the Stable Matching Problem in which there exists a man m and a woman w such that m is ranked first on the preference list of w and w is ranked first on the preference list of m. Then, in every stable matching S for this instance, the pair (m, w) belongs to S.