

University of Nevada, Las Vegas Computer Science 477/677 Fall 2015

Assignment 4: Due September 24, 2015

Do not hand this in.

Name: _____

1. If I asked you to show the the steps of bubblesort, starting with the array QWERTY, this is what you would write:

QWERTY

QEWRTY

QERWTY

QERTWY

EQRTWY

That is, you would not indicate comparison steps at which the array was not changed.

- (a) Show the steps of selection sort (the version given in class on September 17) for the array RWFLOQVNEMU.

- (b) Show the steps of heapsort (the version given in class on September 17) for the array RWFLOQVNEMU. Staple an extra sheet if necessary.

- (c) Show the steps of mergesort (the version given in class on September 17) for the array RWFLOQVNEMU.

- (d) Show the steps of polyphase mergesort (the version given in class on September 17) for the array RWFLOQVNEMU.

- (e) Show the steps of binary tree sort (the version given in class on September 17) for the array RWFLOQVNEMU.

2. Computation of the time complexity of each of the algorithms given in the list below makes use of one of the given recurrences. For each algorithm, indicate which recurrence is appropriate.

The list of algorithms is:

bubblesort,

selection sort,

heapsort,

mergesort,

binary search.

The recurrences are:

(a) $F(n) \leq F(n/2) + 1$

(b) $F(n) \leq F(n - 1) + n$

(c) $F(n) \leq 2F(n/2) + n$

(d) $F(n) \leq F(n - 1) + \log n$

(e) $F(n) \leq 2F(n/2) + \log n$

3. Some of the algorithms mentioned in the first two problems of this homework use the *divide and conquer* paradigm. List them.

4. Does one or more of the algorithms mentioned in this homework use the *greedy* paradigm? If so, which one, or ones? Explain why in each case.

5. Design a dynamic programming algorithm that computes the fewest number of coins needed to make n pence. The available denominations of coins are as follows: 1 penny, 3 pence, 4 pence, 13 pence, 21 pence, and 50 pence. For example, what is the smallest number of coins needed to make 28 pence?