Problem Set #1 (Algorithms)

Department: _____

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For the following problems, consider the insertion sort for an input sequence of n distinct numbers.

1. For each of the following cases, find the number of times that the inner (while) loop test is executed. Note that the loop test is executed one time more than the loop body. Justify your answers mathematically.
(a) The best case
(b) The worst case

2. For each of the following cases, find the running time in Θ-notation. Justify your answers mathematically.
(a) The best case
(b) The worst case
(c) The average case

3. To draw the graphs in Problems 4, 5, and 6, write a program which includes the comments.

4. For each of the following cases, show and explain the step-by-step results of the insertion sort.
(a) One example for the best case
(b) One example for the worst case
(c) One random input sequence

5. For each of the following cases, draw and explain the graph of the number of times that the inner (while) loop test is executed with varying n.
(a) The best case
(b) The worst case
(c) The average case using random input sequences

6. For each of the following cases, draw and explain the graph of the actual running time in your PC with varying n.
(a) The best case
(b) The worst case
(c) The average case using random input sequences