# Basics about you

1. Your name:

2. Your e-mail address:

3. Your major and degree program:

4. Your areas of research interests (if applicable) — feel free to list multiple areas if you are undecided:

5. Titles of relevant classes you have taken before — this may include algorithms, complexity, languages & automata, graph theory, discrete mathematics, probability, linear algebra, mathematical programming,

or others that you can think of:

# Background Knowledge

This section tries to ascertain some basic knowledge we hope you acquired before. This is not a quiz, and

your performance here will not affect your grade. However, if you have serious problems in this section, it may be in your own best interest to review the background material in order to do well in this class.

1. Which of these sorting algorithms have a worst-case running time of Ω(n2) — mark all that apply: Bubble Sort, Heap Sort, Insertion Sort, Merge Sort, Quick Sort (with good median finding), Selection Sort.
2. Which of these sorting algorithms have a worst-case running time of O(n log n) — mark all that apply: Bubble Sort, Heap Sort, Insertion Sort, Merge Sort, Quick Sort (with good median finding), Selection Sort
3. Which of these functions are O(n2) — mark all that apply: 3, (2n)2, (log n)4, 2n, 1/100 n3, log logn,

4n log n, n2 + 4n log n.

1. Which of these functions are Ω(n2) — mark all that apply: 3, (2n)2, (log n)4, 2n, 1/100 n3, log logn,

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1. Among the following subsets of (undirected) graphs, determine which are subsets of each other: (1) cycle (2) tree, (3) forest, (4) connected graph, (5) acyclic graph, (6) bipartite graph, (7) path. For each class A, list all classes B such that the following statement holds: “every A is also a B”.
2. In a graph with n nodes and m edges how long does it take to
   1. Run BFS to find out if there is a path from node A to node B
   2. Run DFS to find out if there is a path from node A to node B
   3. Run BFS to find all points that can be reached from A
   4. Run DFS to find all points that can be reached from A
3. Which of the following statements are true?
   1. BFS can be used to find the shortest path in an undirected graph with equal cost edges in linear time
   2. DFS can be used to find the shortest path in an undirected graph with equal cost edges in linear time
   3. BFS can be used to find the shortest path in a directed graph with equal cost edges in linear time
   4. DFS can be used to find the shortest path in a directed graph with equal cost edges in linear time
   5. BFS can be used to find the shortest path in a weighted undirected graph in linear time
   6. DFS can be used to find the shortest path in a weighted undirected graph in linear time
   7. BFS can be used to find the shortest path in a weighted directed graph in linear time
   8. DFS can be used to find the shortest path in a weighted directed graph in linear time
   9. BFS can be used to find the shortest path in a weighted undirected graph in quadratic time
   10. DFS can be used to find the shortest path in a weighted undirected graph in quadratic time
   11. BFS can be used to find the shortest path in a weighted directed graph in quadratic time
   12. DFS can be used to find the shortest path in a weighted directed graph in quadratic time