CSE 373 Final (100 points)
20^{th} Decemeber: 5-7:30pm
Open Book and Notes.

Instructions: Write only precise answers (with minimal scratch work) in the space provided for answers. For additional scratch work, you may use the back of the pages. **Please write your name below.**

Name:

1. **Asymptotic Notation (10 points)**.
   Prove that $(1 + 2 + 3 + \ldots + n)^2 = \Theta(n^4)$.

2. **Sorting (15 points)**.
   Exercise 4-6.

3. **Graphs (15 points)**.
   Exercise 5.17.

4. **Greedy Algorithms (20 points)**.
   Exercise 5.13 (a).
   Hint: When would you ever choose a leaf to be part of the minimum-size vertex cover?

5. **Dynamic Programming and Divide-and-Conquer (40 points)**

Exercise 8-22 (a) and (b). For (b), I want you to give *both* dynamic programming and divide-and-conquer algorithms.
Hints for (b): Let the given numbers be in an array $A[1..n]$.

- For dynamic programming, define S_i as the maximum contiguous subvector that *ends* at the $A[i]$ number. Then, compute $S_1, S_2, \ldots, S_n$ in that order by computing S_i from S_{i-1}.
- Divide and conquer strategy is "similar" to the merge sort. Basically, divide the original array A into A_{left} and A_{right} arrays of half the size. Now, notice that the maximum contiguous subvector in A either lies completely in A_{left}, or lies completely in A_{right}, or spans across both A_{left} and A_{right}. The first two are available by recursion, and the third can be computed in $O(n)$.