1. Suppose that algorithm $A$ uses $293907n^3$ operations while algorithm $B$ uses $3n^5$ operations. Determine the value $n_0$ such that $A$ is as fast or faster than $B$ for all $n \geq n_0$. [4 points]

2. exercise 3.1-4, p 50. Additionally, is $2^{2n+1} = O(2^{2^n})$? [4 points]

3. exercise 3-2, p 58 [8 points]

4. exercise 3-3, part a (not part b), p 58. [8 points]

5. An algorithm takes $0.2ms$ for input size 10 (this allows you to determine the constant $c$, which will be different in each case). How large of an input can be finished in an hour if the algorithm’s run time is …?

   (a) $cn$
   (b) $cn\log n$
   (c) $cn^3$
   (d) $c2^n$

   [8 points]

6. Describe how to find the minimum and maximum of an array of $n$ elements with at most $\frac{3}{2}n$ element comparisons. (Do not count comparisons needed for the array indices.) [4 points]

Total: 36 points

Notes:

- For Q2, we are not asking you to do questions 1 through 4. Just question 4 of section 3.1.
- In Q4, ignore any function involving a $\lg^*$.
- A $ms$ is 1/1000 of a second. Also, for the $n\log n$ part, you can approximate $n$.
- Hint for Q6: form $\lceil \frac{n}{2} \rceil$ pairs, from each pair find candidate min and candidate max for the whole list.