1. Suppose that algorithm \( A \) uses \( 313 \cdot n^3 \) operations while algorithm \( B \) uses \( 2 \cdot n^4 \) operations. Determine the value \( N \) such that \( A \) is as fast or faster than \( B \) for all \( n \geq N \). [4 points]

2. exercise 3.1-4, p 53. Additionally, is \( 2^{2n+1} = O(2^{2n}) \)? [5 points]

3. exercise 3-2, p 61. [8 points]

4. An algorithm takes 0.4\( ms \) for input size 50 (this allows you to determine the constant \( c \), which will be different in each case). How large of an input can be solved in one hour if the run time of the algorithm is . . . ?
   
   (a) \( c \cdot n \)
   (b) \( c \cdot n \log n \)
   (c) \( c \cdot n^3 \)
   (d) \( c \cdot 2^n \)

   [8 points]

5. exercise 2-3, p 41. [8 points]

6. (Implement a queue using two stacks) Exercise 10.1-6, p 236 [6 points]

Total: 33 points

Notes:

- For Q2, we are not asking you to do questions 1 through 4. Just question 4 of section 3.1.
- An \( ms \) is 1/1000 of a second, also called a millisecond.