CSC-361 Homework: Algorithm Analysis I

Unless explicitly stated, in all questions, show work. Any solution descriptions must be written with full sentences. Please submit your solutions as a pair.

1. An algorithm takes `1 ms` for input size 100. How long will it take for input size 500 if the running time of the algorithm is each of the following (in turn)? Assume low-order terms are negligible.

   (a) constant
   (b) linear
   (c) quadratic

2. Investigate each set of functions using a graphing calculator (such as desmos) in order to rank the functions by increasing order of growth. **Be careful!** If the growth rates of any functions are equivalent, state that fact clearly. No work need be shown.

   (a) $2, \dfrac{1}{n}, \log\log\log n, \dfrac{n}{\log n}, n^{0.99}$
   (b) $2^n, n \cdot 2^{\frac{n}{2}}, \log n^n, n!$

3. Show $2^n - n^2 \in \Theta(2^n + n^2)$ using two methods: (a) by choosing appropriate constants c_1, c_2 and (2) using limits.