CSE 2331 - Problem Set 1
Due lecture on September 4th

Problem numbers are from the third edition of "Introduction to algorithms". If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, etc.) is prohibited.

1. What is the smallest value of n such that an algorithm whose running time is $100n$ runs faster than an algorithm whose running time is 2^n on the same machine?

2. Illustrate the operation of INSERTION-SORT on the array
$$A = (31, 31, 59, 26, 41, 58).$$

3. 2.1-3

4. Give the asymptotic complexity (Θ) of each of the following functions in simplest terms and then order the functions by asymptotic dominance. That is, produce a permutation $f_1(n), f_2(n), \ldots$ such that $f_i = O(f_{i+1})$. Note if any two functions are asymptotically equivalent, i.e. if $f_i = \Theta(f_{i+1})$.

   (a) $f_a(n) = \log_2(n^2 + 7)\log_2(5n^{0.7} + 1)$
   (b) $f_b(n) = \sum_{i=1}^{n^3} \left(\frac{1}{4}\right)^i$
   (c) $f_c(n) = 2\log_4(4n + 17)$
   (d) $f_d(n) = \sum_{j=1}^{3n}(4j + 1)$
   (e) $f_e(n) = 3^{16}$
   (f) $f_f(n) = 6n^{0.5} + 3n^{0.7}$

(g) $f_g(n) = 6\log_5(n^5 + 3n^3) + 3n^{0.2}$

(h) $f_h(n) = \sqrt{3n^3 + 2n + 74}$

(i) $f_i(n) = 5\log_2(3n^2 + n + 8)$

(j) $f_j(n) = \sqrt{2\log_2(n) + 3 + 7n}$

(k) $f_k(n) = 2n\log_3(2n^3 + 17n + 1)$

(l) $f_l(n) = 2\log_3(n) + \sqrt{2n} + 3n$