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. 1.2-3, 3.1-1, 3-4 except 3-4 h.

2. Illustrate the operation of INSERTION-SORT on the array

   \( A = (31, 59, 59, 26, 41, 58) \).

3. Give the asymptotic complexity (\( \Theta \)) 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) \( f_b(n) = \sum_{i=1}^{\sqrt{n}} \left( \frac{1}{4} \right)^i \)
   (c) \( f_c(n) = 2 \log_4(4n + 17) \)
   (d) \( f_d(n) = \sum_{j=1}^{4n} (3j + 1) \)
   (e) \( f_e(n) = 16^3 \)
   (f) \( f_f(n) = 6n^{0.5} + 3n^{0.1} \)
   (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)  \( f_l(n) = 2 \log_3(n) + \sqrt{2n + 3n^2} \)