Home Assignment #1.

3.1. Big O notation

1. $\frac{n^2}{3} - 3n = O(n^2)$

$\frac{n^2}{3} - 3n \leq c \cdot n^2$, for some $n \geq n_0$

$\frac{1}{3} - \frac{3}{n} \leq c$

For $n_0 = 1$ and $c = \frac{1}{3} \longrightarrow \frac{1}{3} - \frac{3}{n} \leq c$

2. $k_1 n^2 + k_2 n + k_3 = O(n^2)$

$k_1 n^2 + k_2 n + k_3 \leq c n^2$, for some $n \geq n_0$

$k_1 + \frac{k_2}{n} + \frac{k_3}{n^2} \leq c$

For $n_0 = 1$ and $c = k_1 + k_2 + k_3 \longrightarrow k_1 + \frac{k_2}{n} + \frac{k_3}{n^2} \leq c$

3. $3^n = O(2^n)$

$3^n \leq c \cdot 2^n$, for

$\left(\frac{3}{2}\right)^n \leq c$

Therfore, the Big-Oh condition cannot hold (the left side of the latter inequality is growing infinitely, so that there is no such constant factor c).

4. $0.001n \cdot \log n - 2000n + 6 = O(n \log n)$

$0.001n \cdot \log n - 2000n + 6 \leq c \cdot n \cdot \log n$, for some $n \geq n_0$

$$0.001 - \frac{2000}{\log n} + \frac{6}{n \log n} \leq c$$

For $n_0 = 2$ and $c = 7 \longrightarrow 0{,}001 - \frac{2000}{\log n} + \frac{6}{n \log n} \leq c$

3.2 Hashing

1.

$\boxed{0}$

$\boxed{1}$

$\boxed{2}$

$\boxed{3} \rightarrow \boxed{17}$

$\boxed{4}$

$\boxed{5} \rightarrow \boxed{19} \rightarrow \boxed{26}$

$\boxed{6} \rightarrow \boxed{13} \rightarrow \boxed{48}$

2.

13	48		17		19	26
0	1	2	3	4	5	6

3.

	48	26	17		19	13
0	1	2	3	4	5	6