University of Waterloo
CS240 Fall 2017
Assignment 1 Post Mortem

Problem 1

Parts a, b and c were generally well done.
Some students used $n_0 \geq 0$ with $\log(n)$
In part d, some students did not take into account all the possible values of c (e.g. the case where $c < 1$, $1 \leq c \leq n_0$).

Problem 2

Problem 2 was generally well done

Problem 3

Part a was poorly done and many students thought it was true. Some attempted proofs did not negate the formal definition of o and ω, using instead an informal definition of the negation, while others did not include both of $\exists n_0 > 0$ and $\forall n \geq n_0$ when negating.

In 3b many students tried to bound $\frac{f(n)}{h(n)}$ with

$$\frac{c_1 g(n)}{c_3 g(n)} \leq \frac{f(n)}{h(n)} \leq \frac{c_2 g(n)}{c_4 g(n)}$$

instead of

$$\frac{c_1 g(n)}{c_4 g(n)} \leq \frac{f(n)}{h(n)} \leq \frac{c_2 g(n)}{c_3 g(n)}$$

where $c_1 g(n) \leq f(n) \leq c_2 g(n)$ and $c_3 g(n) \leq h(n) \leq c_4 g(n)$ from the definition of $f(n) \in \Theta(g(n))$ and $h(n) \in \Theta(g(n))$.

In part c, many students incorrectly said that the answer is true. Some gave the invalid answer that $2^{f(n)}$ can be bounded using $2^{(c_1-1)g(n)}g(n)$ and $2^{(c_2-1)g(n)}g(n)$, given $f(n)$ bounded by $c_1 g(n)$ and $c_2 g(n)$, however $2^{(c-1)g(n)}$ is not a constant as it is dependent on $g(n)$ and hence n.
In part d, many students assumed that one of f or g is always equal to the min(f(n), g(n)), rather than noting that the minimum is conditionally equal to f or g, or proving the result directly using the minimum.

Problem 4

Part a was very well done,
Part b and c were reasonably well done, but students often ignored the ceiling rather than bounding it.
On part c some students did not reduce the result to its simplest form.