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Tutorial 2 for
COMP 526 – Applied Algorithmics, Spring 2021

Problem 1 (Loop-invariant method and analysis)

Consider again the *Mod* function from last time:

```
1    procedure Mod(n, k)
2    // Input: positive integers n, k.
3    // Output: value of n mod k.
4    t := n
5    while t ≥ k
6        t := (t − k)
7    end while
8    return t
```

a) Apply the *invariant method* to prove the correctness of the function $Mod(n, k)$, which is supposed to compute $n \bmod k$, where n and k are two positive integer input parameters of the function.

b) Try to establish the time complexity of this procedure.

   Hint: You might find it helpful to revisit the potential function from last week.

Problem 2 (Orders of magnitude)

Order the following functions with respect to their asymptotic order of magnitude (i.e., their Θ-class).

$$\lg n, \ n, \ \sqrt{n}, \ n^{1.5}, \ n^2, \ n \lg n, \ n \lg \lg n, \ n \lg^2 n, \ n \lg(n^2), \ \frac{2}{n}, \ 2^n, \ 2^{n/2}, \ 37, \ n^3, \ n^2 \lg n.$$