

## Skill Problem F: Correctness and Running Time

The *T-Numbers* are defined as follows:

$$T_0 = 0, T_1 = 2, T_n = T_{n-1} + 3T_{n-2} + 1.$$

The following algorithm `Tnum` is a recursive algorithm that computes the T-Numbers

**Algorithm** `Tnum` ( $n$ )

**Input:** A non-negative integer  $n$

**Output:** The T-number  $T_n$

**if** ( $n = 0$ ) **then** return 0

**else if** ( $n = 1$ ) **then** return 2

**return** `Tnum` ( $n - 1$ ) + 3 \* `Tnum` ( $n - 2$ ) + 1

Do the following:

1. [4 points] Show that `Tnum` is correct
2. [5 points] Show that `Tnum` has exponential running time (be sure to use the definition of "exponential running time" given in the slides – there are two things to prove here).