Assignment #6

Name: _____ ID: _____

This assignment has **2** questions, for a total of **25** marks.

Question 1: **Diverging with references** . . . . . 10 marks

Using references, there exists a (syntactically) well-typed closed term that (i) does not use roll nor unroll and (ii) diverges. Write such a term [2], prove that it is well-typed [4] and show that it diverges [4].

Question 2: **Natural numbers-based heap** ..... 15 marks

In this exercise you will replace the abstract heap of System F with an assembly-like one. Drop all terms, types, typing rules, evaluation contexts and primitive reduction rules related to the heap with abstract locations. Add a heap that is a map from natural numbers to values ($H ::= \varnothing \mid H; n \mapsto v$). Add terms for allocating, reading and writing on the new heap (Hint: to start, identify the type of locations). Show typing rules for heap-related terms [5] as well as COS rules for heap-related terms [5].

These additions must keep the language safe (normalisation is not achievable, as suggested by the first exercise), so argue why the additions are safe [5].