

Types and Programming Languages

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1. References

Exercise 13.4.1

Find a term whose evaluation will create a cyclic structure in the store.

Solution: Let's consider the following term:

```
let r1 = ref (\x:Nat. x) in
let r2 = ref (\x:Nat. (!r1) x) in
(r1 := \x:Nat. (!r2) x);
r2
```

□

Exercise 13.5.2

Give an example of a store μ which is well typed with respect to two different store typings Σ_1 and Σ_2 , i.e.

$$\Gamma \mid \Sigma_1 \vdash \mu \text{ and } \Gamma \mid \Sigma_2 \vdash \mu.$$

Solution: Let μ be a store with a single location ℓ :

$$\mu = (\ell \mapsto \backslash x:\text{Unit}. (!\ell) x),$$

and Γ be the empty context. Then μ is well typed with respect to the following store typings:

$$\Sigma_1 = (\ell : \text{Unit} \rightarrow \text{Unit}),$$

$$\Sigma_2 = (\ell : \text{Unit} \rightarrow (\text{Unit} \rightarrow \text{Unit})).$$

Note 1.1

The key is some sort of recursion achieved by referencing oneself in the store. To prevent

□