Harvard School of Engineering and Applied Sciences — CS 152: Programming Languages

Type Inference
Section and Practice Problems

March 30 – Apr. 3, 2020

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1 Type Inference

(a) Recall the constraint-based typing judgment $\Gamma \vdash e : \tau \triangleright C$. Give inference rules for products and sums. That is, for the following expressions.

- (e_1, e_2)
- $\#1\ e$
- $\#2\ e$
- $\mathsf{inl}_{\tau_1+\tau_2}\ e$
- $\mathsf{inr}_{\tau_1+\tau_2}\ e$
- $\mathsf{case}\ e_1\ \mathsf{of}\ e_2 \mid e_3$

(b) Determine a set of constraints C and type τ such that

$$\vdash \quad \lambda x : A.\, \lambda y : B.\, (\#1\ y) + (x\ (\#2\ y)) + (x\ 2) \quad : \tau \triangleright C$$

and give the derivation for it.

(c) Recall the unification algorithm from Lecture 14. What is the result of $\mathit{unify}(C)$ for the set of constraints C from Question 1(b) above?