Lab Sheet 6 Answers

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Natural Semantics for Booleans:

$$\frac{}{\langle true, \sigma \rangle \to \top} \; [\text{tt}_{\text{ns}}]$$

$$\frac{}{\langle false, \sigma \rangle \to \bot} \; [\text{ff}_{\text{ns}}]$$

$$\frac{\langle a_1, \sigma \rangle \to lhs \quad \langle a_2, \sigma \rangle \to rhs}{\langle a_1 = a_2, \sigma \rangle \to \begin{cases} \top & \text{if } lhs = rhs \\ \bot & \text{otherwise} \end{cases}} \; [\text{eq}_{\text{ns}}]$$
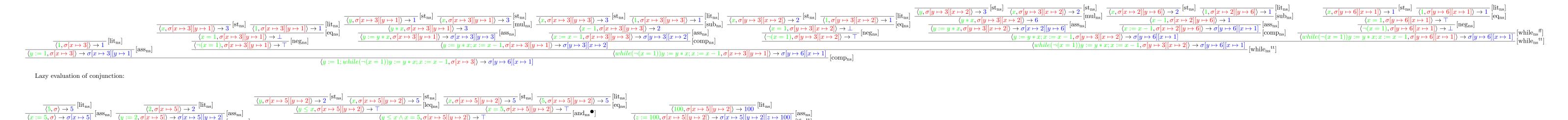
$$\frac{\langle a_1, \sigma \rangle \to lhs \quad \langle a_2, \sigma \rangle \to rhs}{\langle a_1 \leq a_2, \sigma \rangle \to \begin{cases} \top & \text{if } lhs \leq rhs \\ \bot & \text{otherwise} \end{cases}} \; [\text{leq}_{\text{ns}}]$$

$$\frac{\langle b, \sigma \rangle \to val}{\langle \neg b, \sigma \rangle \to \neg val} \; [\text{neg}_{\text{ns}}]$$

$$\frac{\langle b_1, \sigma \rangle \to \bot}{\langle b_1 \wedge b_2, \sigma \rangle \to \bot} \; [\text{and}_{\text{ns}}{}^{\circ}]$$

$$\frac{\langle b_1, \sigma \rangle \to \bot \quad \langle b_2, \sigma \rangle \to rhs}{\langle b_1 \wedge b_2, \sigma \rangle \to rhs} \; [\text{and}_{\text{ns}}{}^{\bullet}]$$

$$\frac{\dfrac{}{\langle false, \sigma \rangle \to \bot}}{\langle \neg(false), \sigma \rangle \to \top}$$

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Evaluation of Factorial Program:

Lazy evaluation of conjunction:

Strict evaluation of conjunction: