Typesetting examples in the style of Pierce's book

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I use an ad-hoc collection of tools for typesetting:

- For representing object language syntax, I define macros in the style shown above, extending the set as necessary to cover new language features. This is tedious, but it helps me keep things well-formed.

- For stating inference rules, I use the `bcprules` package.

- For showing derivations, I use the `proof` package.

For example, here are the inference rules in Figures 8-1 and 8-2 on p.93:

$$\texttt{true} : \texttt{Bool} \qquad\qquad\qquad (\text{T-TRUE})$$

$$\texttt{false} : \texttt{Bool} \qquad\qquad\qquad (\text{T-FALSE})$$

$$\frac{\texttt{t}_1 : \texttt{Bool} \qquad \texttt{t}_2 : \texttt{T} \qquad \texttt{t}_3 : \texttt{T}}{\texttt{if } \texttt{t}_1 \texttt{ then } \texttt{t}_2 \texttt{ else } \texttt{t}_3 : \texttt{T}} \qquad (\text{T-IF})$$

$$\texttt{0} : \texttt{Nat} \qquad\qquad\qquad (\text{T-ZERO})$$

$$\frac{\texttt{t}_1 : \texttt{Nat}}{\texttt{succ } \texttt{t}_1 : \texttt{Nat}} \qquad\qquad (\text{T-SUCC})$$

$$\frac{\texttt{t}_1 : \texttt{Nat}}{\texttt{pred } \texttt{t}_1 : \texttt{Nat}} \qquad\qquad (\text{T-PRED})$$

$$\frac{\texttt{t}_1 : \texttt{Nat}}{\texttt{iszero } \texttt{t}_1 : \texttt{Bool}} \qquad\qquad (\text{T-ISZERO})$$

Here is the text of Lemma 8.2.2 on p. 94:

1. If $\mathtt{true} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Bool}$.

2. If $\mathtt{false} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Bool}$.

3. If $\mathtt{if}\ \mathtt{t_1}\ \mathtt{then}\ \mathtt{t_2}\ \mathtt{else}\ \mathtt{t_3} : \mathtt{R}$, then $\mathtt{t_1} : \mathtt{Bool}$, $\mathtt{t_2} : \mathtt{R}$, and $\mathtt{t_3} : \mathtt{R}$.

4. If $\mathtt{0} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Nat}$.

5. If $\mathtt{succ}\ \mathtt{t_1} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Nat}$ and $\mathtt{t_1} : \mathtt{Nat}$.

6. If $\mathtt{pred}\ \mathtt{t_1} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Nat}$ and $\mathtt{t_1} : \mathtt{Nat}$.

7. If $\mathtt{iszero}\ \mathtt{t_1} : \mathtt{R}$, then $\mathtt{R} = \mathtt{Bool}$ and $\mathtt{t_1} : \mathtt{Nat}$.

Finally, here is the derivation near the bottom of p. 94:

$$
\cfrac{\cfrac{\cfrac{\overline{\mathtt{0 : Nat}}\ \text{T-Zero}}{\mathtt{iszero\ 0 : Bool}}\ \text{T-IsZero} \qquad \cfrac{}{\mathtt{0 : Nat}}\ \text{T-Zero} \qquad \cfrac{\overline{\mathtt{0 : Nat}}\ \text{T-Zero}}{\mathtt{pred\ 0 : Nat}}\ \text{T-Pred}}{\mathtt{if\ iszero\ 0\ then\ 0\ else\ pred\ 0 : Nat}}}{}\ \text{T-If}
$$

I'm sure there are better ways of doing some or all of these things; contributions and suggestions are welcome!