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:

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

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

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

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

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

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

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

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

1. If $\texttt{true} : \texttt{R}$, then $\texttt{R} = \texttt{Bool}$.
2. If $\texttt{false} : \texttt{R}$, then $\texttt{R} = \texttt{Bool}$.
3. If $\texttt{if } t_1 \texttt{ then } t_2 \texttt{ else } t_3 : \texttt{R}$, then $t_1 : \texttt{Bool}$,$t_2 : \texttt{R}$, and $t_3 : \texttt{R}$.
4. If $\texttt{0} : \texttt{R}$, then $\texttt{R} = \texttt{Nat}$.
5. If $\texttt{succ } t_1 : \texttt{R}$, then $\texttt{R} = \texttt{Nat}$ and $t_1 : \texttt{Nat}$.
6. If $\texttt{pred } t_1 : \texttt{R}$, then $\texttt{R} = \texttt{Nat}$ and $t_1 : \texttt{Nat}$.
7. If $\texttt{iszero } t_1 : \texttt{R}$, then $\texttt{R} = \texttt{Bool}$ and $t_1 : \texttt{Nat}$.

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

$$\dfrac{\dfrac{\dfrac{}{\texttt{0} : \texttt{Nat}}\ \text{T-Zero}}{\texttt{iszero 0} : \texttt{Bool}}\ \text{T-IsZero} \quad \dfrac{}{\texttt{0} : \texttt{Nat}}\ \text{T-Zero} \quad \dfrac{\dfrac{}{\texttt{0} : \texttt{Nat}}\ \text{T-Zero}}{\texttt{pred 0} : \texttt{Nat}}\ \text{T-Pred}}{\texttt{if iszero 0 then 0 else pred 0} : \texttt{Nat}}\ \text{T-If}$$

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