

cr.1 $\beta\eta$ -reduction

lam:cr:be:
sec The Church-Rosser property holds for $\beta\eta$ -reduction ($\xrightarrow{\beta\eta}$).

lam:cr:be:
lem:one-par **Lemma cr.1.** *If $M \xrightarrow{\beta\eta} M'$, then $M \xrightarrow{\beta\eta} M'$.*

Proof. By induction on the derivation of $M \xrightarrow{\beta\eta} M'$. If $M \xrightarrow{\beta} M'$ by η -conversion (i.e., ??), we use ??. The other cases are as in ??. \square

lam:cr:be:
lem:par-red **Lemma cr.2.** *If $M \xrightarrow{\beta\eta} M'$, then $M \xrightarrow{\beta\eta} M'$.*

Proof. Induction on the derivation of $M \xrightarrow{\beta\eta} M'$.

If the last rule is ??, then M is $\lambda x.Nx$ and M' is N' for some x, N, N' where $x \notin FV(N)$ and $N \xrightarrow{\beta\eta} N'$. Thus we can first reduce $\lambda x.Nx$ to N by η -conversion, followed by the series of $\xrightarrow{\beta\eta}$ steps that show that $N \xrightarrow{\beta\eta} N'$, which holds by induction hypothesis. \square

lam:cr:be:
lem:str **Lemma cr.3.** *$\xrightarrow{\beta\eta}$ is the smallest transitive relation containing $\xrightarrow{\beta\eta}$.*

Proof. As in ?? \square

lam:cr:be:
thm:cr **Theorem cr.4.** *$\xrightarrow{\beta\eta}$ satisfies Church-Rosser property.*

Proof. By ??, ?? and **Lemma cr.3.** \square

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Bibliography