λ Lambda Calculus Calculator

Help | About

Rewrite Rules

1. $XOR = \lambda p.\lambda q.p\ (NOT\ q)\ q$
2. $NOT = \lambda p.\lambda q.\lambda r.p\ r\ q$
3. $F = \lambda p.\lambda q.q$
4. $T = \lambda p.\lambda q.p$
5. *Church Numerals (e.g. 3 will be replaced by* $\lambda f.\lambda x.f\ (f\ (f\ x))$)

$id = \lambda x.x$ +

Active Strategy

- (•) Innermost first
- ( ) Outermost first

Derivation

$XOR\ p\ (NOT\ p)$ Start

1. $(XOR)\ p\ ((NOT)\ p)$ ∵ δ
2. $(\lambda p.\lambda q.p\ ((NOT)\ q)\ q)\ \ p\ \ ((NOT)\ p)$ ∵ δ
3. $(\lambda p.\lambda q.p\ ((\lambda p.\lambda q.\lambda r.prq)\ \ q)\ q)\ \ p\ \ ((NOT)\ p)$ ∵ β
4. $(\lambda p.\lambda q.p(\lambda q1.\lambda r.qrq1)q)\ \ p\ \ ((NOT)\ p)$ ∵ β
5. $(\lambda q.p(\lambda q1.\lambda r.qrq1)q)\ \ ((NOT)\ p)$ ∵ δ
6. $(\lambda q.p(\lambda q1.\lambda r.qrq1)q)\ \ ((\lambda p.\lambda q.\lambda r.prq)\ \ p)$ ∵ β
7. $(\lambda q.p(\lambda q1.\lambda r.qrq1)q)\ \ (\lambda q.\lambda r.prq)$ ∵ β
8. $p(\lambda q1.\lambda r.((\lambda q.\lambda r.prq)\ \ r)\ q1)(\lambda q.\lambda r.prq)$ ∵ β
9. $p(\lambda q1.\lambda r.((\lambda r1.pr1r)\ \ q1))(\lambda q.\lambda r.prq)$ ∵ β
10. $p(\lambda q1.\lambda r.pq1r)(\lambda q.\lambda r.prq)$

Next Step | Next 50 Steps