

Figure 1: timing-pattern

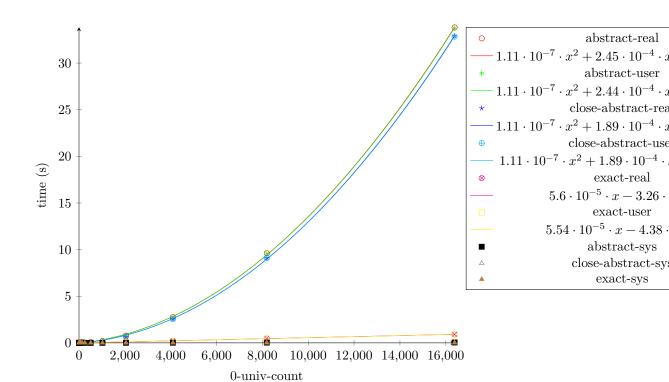


Figure 2: timing-n-polymorphic-universes param-1-n 0

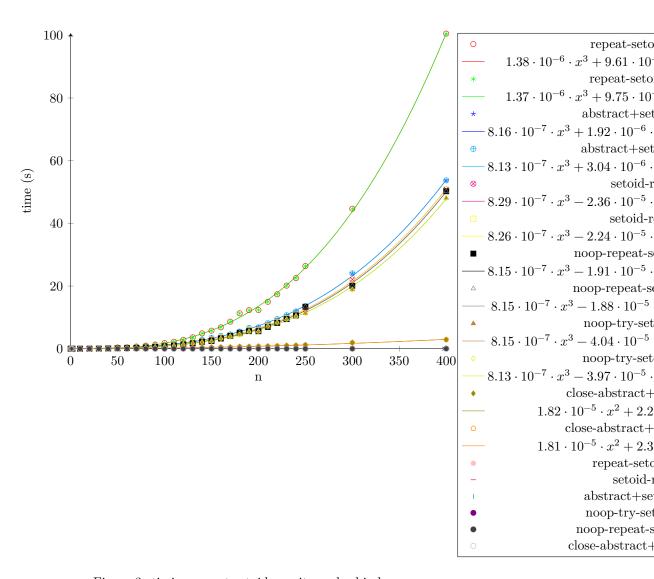


Figure 3: timing-repeat-setoid-rewrite-under-binders

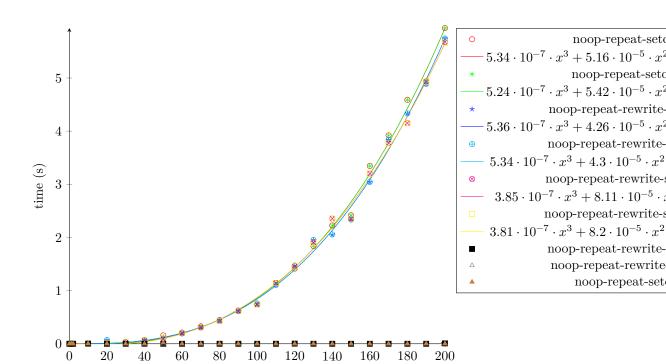


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

n

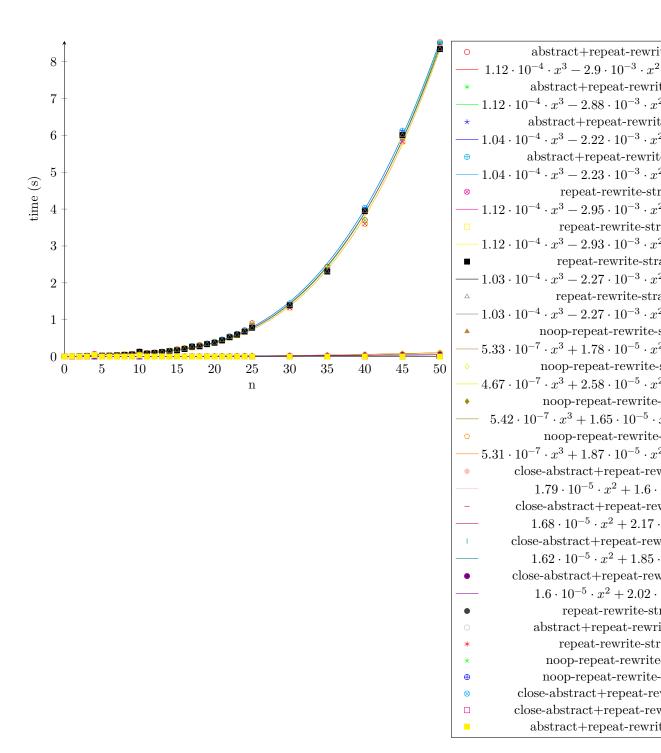
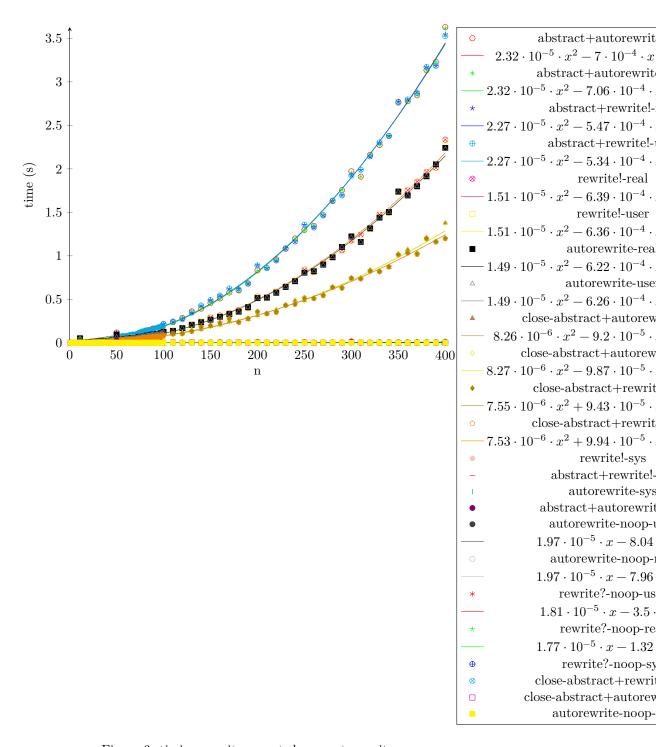


Figure 5: timing-rewrite-strat-under-binders



 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$

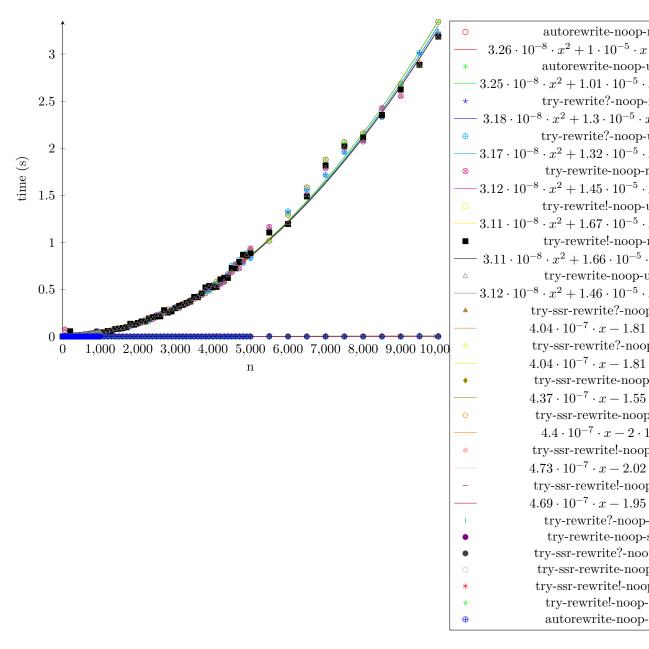


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

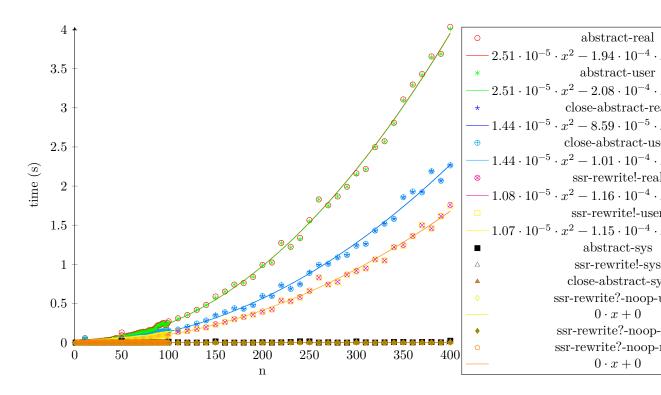


Figure 8: timing-rewrite-repeated-app-ssrrewrite

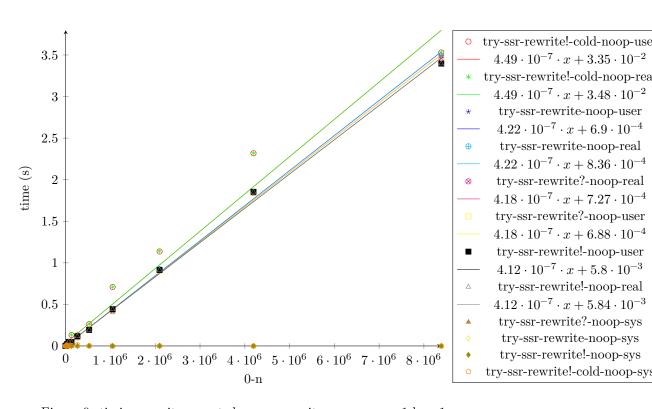


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

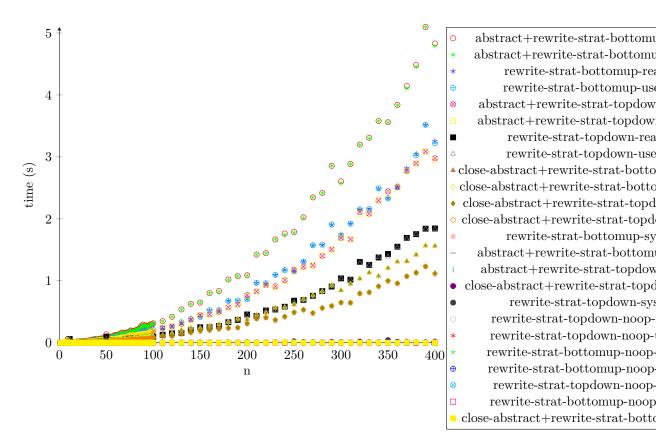
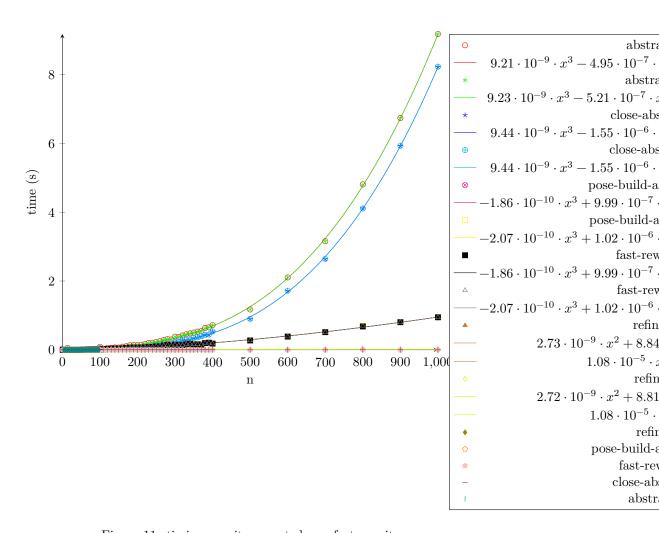
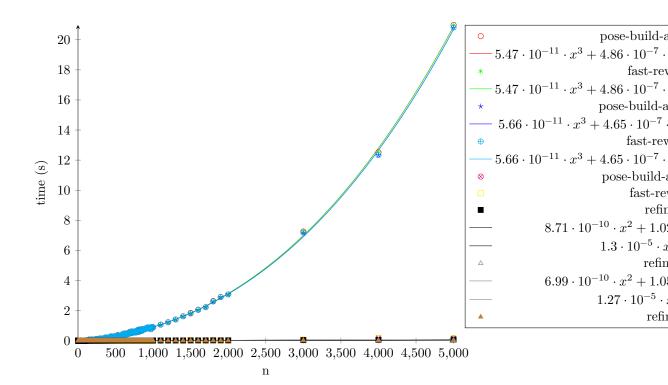


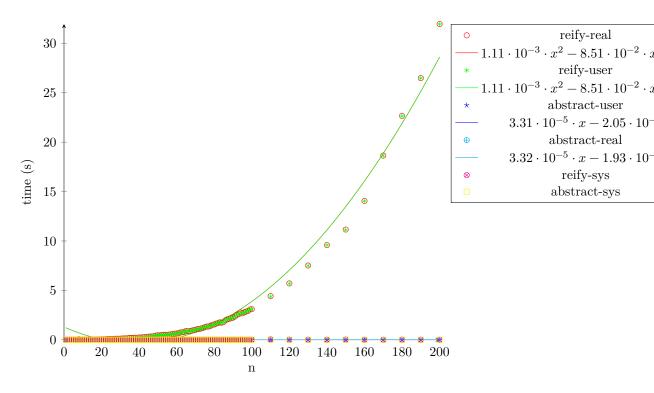
Figure 10: timing-rewrite-repeated-app-rewrite-strat



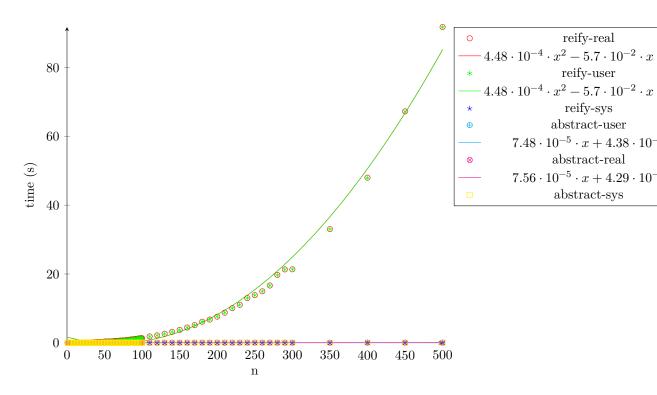
 $Figure~11:~timing\mbox{-rewrite-repeated-app-fast-rewrite}$



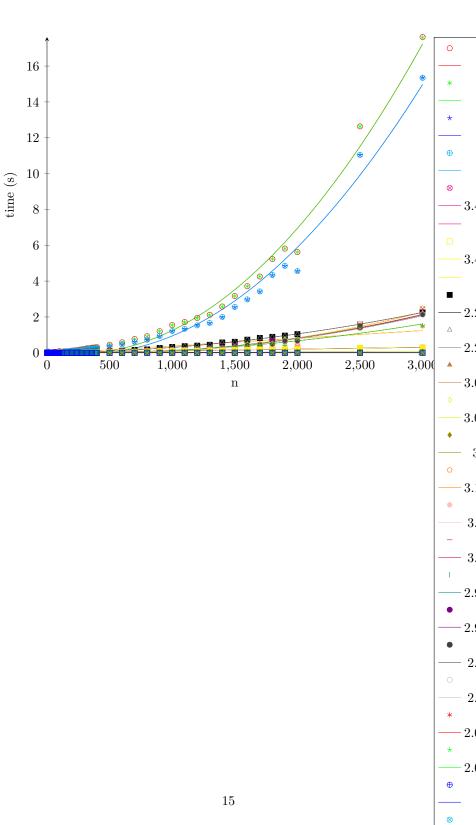
Figure~12:~timing-rewrite-repeated-app-fast-rewrite-no-abstract



 ${\bf Figure~13:~timing-type class-reification-let-in-HOAS}$



Figure~14:~timing-type class-reification-let-in-PHOAS



 $2.29 \cdot 10^{-6} \cdot x^2 - 1.17 \cdot 10^{-6}$ $2.29 \cdot 10^{-6} \cdot x^2 - 1.17 \cdot 10^{-6}$ $2.07 \cdot 10^{-6} \cdot x^2 - 1.25 \cdot 10^{-6}$ $2.07 \cdot 10^{-6} \cdot x^2 - 1.25 \cdot 10^{-6}$ $3.45 \cdot 10^{-7} \cdot x^2 - 2.85 \cdot 10^{-4} \cdot x^2$ $3.44 \cdot 10^{-7} \cdot x^2 - 2.85 \cdot 10^{-4} \cdot x^2$ $2.24 \cdot 10^{-7} \cdot x^2 + 8.18 \cdot 10^{-5} \cdot x^2$ $2.24 \cdot 10^{-7} \cdot x^2 + 8.24 \cdot 10^{-5} \cdot x^2$ $3.06 \cdot 10^{-7} \cdot x^2 - 2.09 \cdot 10^{-4} \cdot x^2$ $3.05 \cdot 10^{-7} \cdot x^2 - 2.07 \cdot 10^{-4} \cdot x^2$ $3.14 \cdot 10^{-7} \cdot x^2 - 2.35 \cdot 10^{-4}$ $3.14 \cdot 10^{-7} \cdot x^2 - 2.34 \cdot 10^{-4} \cdot x^2$ $3.1 \cdot 10^{-7} \cdot x^2 - 2.25 \cdot 10^{-4} \cdot x$ $3.1 \cdot 10^{-7} \cdot x^2 - 2.26 \cdot 10^{-4} \cdot x$ $2.94 \cdot 10^{-7} \cdot x^2 - 1.97 \cdot 10^{-4} \cdot x^2$ $2.94 \cdot 10^{-7} \cdot x^2 - 1.97 \cdot 10^{-4} \cdot x^2$ $2.99 \cdot 10^{-7} \cdot x^2 - 2.1 \cdot 10^{-4} \cdot x$ $2.99 \cdot 10^{-7} \cdot x^2 - 2.1 \cdot 10^{-4} \cdot x$ $2.04 \cdot 10^{-7} \cdot x^2 - 7.64 \cdot 10^{-5} \cdot x^2$ $2.04 \cdot 10^{-7} \cdot x^2 - 7.62 \cdot 10^{-5} \cdot x^2$

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

refine-user

 $4.3 \cdot 10^{-4} \cdot x - 5.26 \cdot$ refine-real

 $4.31 \cdot 10^{-4} \cdot x - 5.27 \cdot$

close-abstract-use

close-abstract-rea

check-pf-cast-rea

check-pf-cast-use

check-admit-cast-r

check-admit-cast-u

type-admit-cast-re

type-admit-cast-us

type-admit-user

type-admit-real

type-pf-cast-user

type-pf-cast-real

check-admit-user

check-admit-real

build-eval-thunk-ua

 $1.02 \cdot 10^{-4} \cdot x - 2.56 \cdot$ build-eval-thunk-re $1.02 \cdot 10^{-4} \cdot x - 4.56 \cdot$ build-thunk-user $1.01 \cdot 10^{-4} \cdot x - 3.05 \cdot$ build-thunk-real $1.02 \cdot 10^{-4} \cdot x - 8.9 \cdot$ ob ools T