

Figure 1: timing-pattern

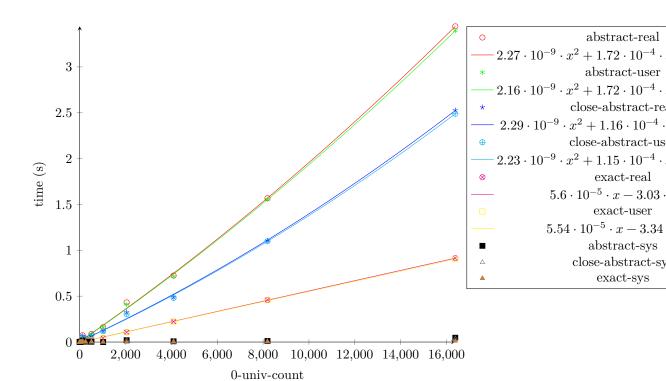


Figure 2: timing-n-polymorphic-universes param-1-n 0

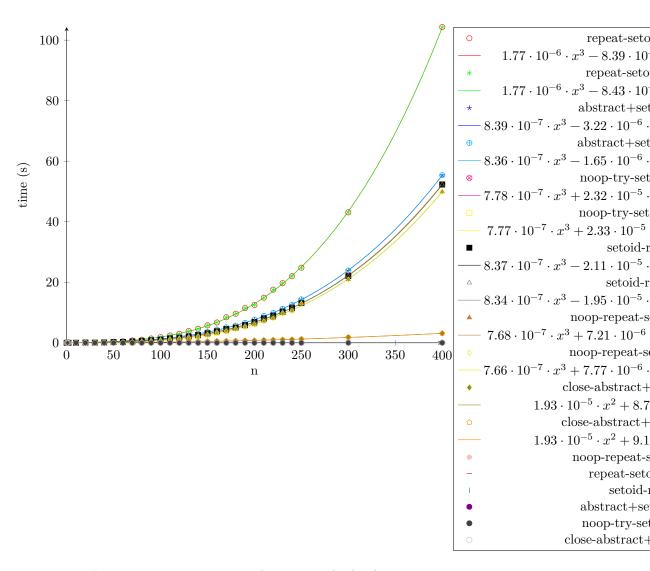
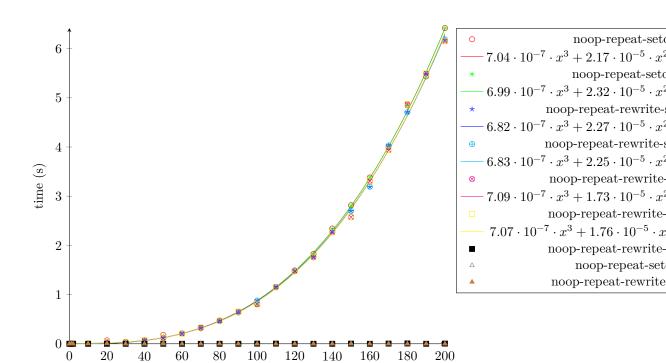


Figure 3: timing-repeat-setoid-rewrite-under-binders



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

n

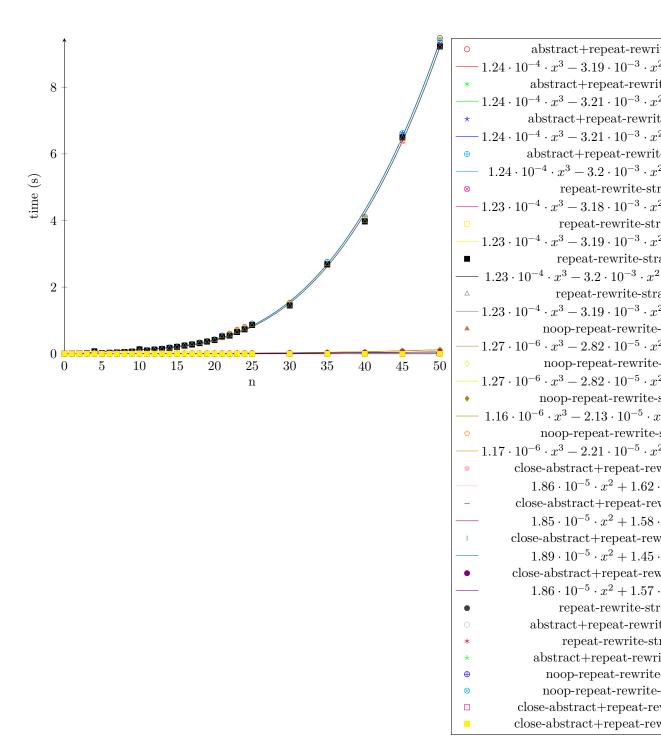
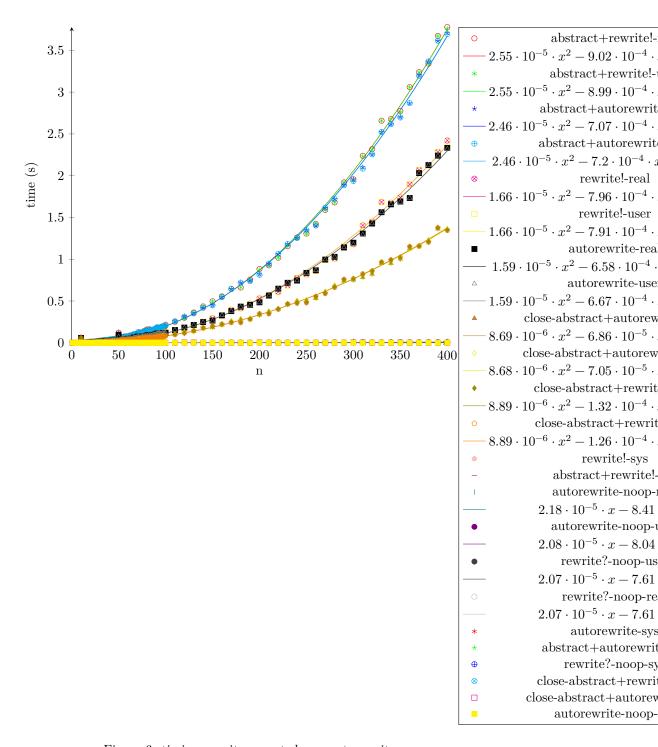


Figure 5: timing-rewrite-strat-under-binders



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

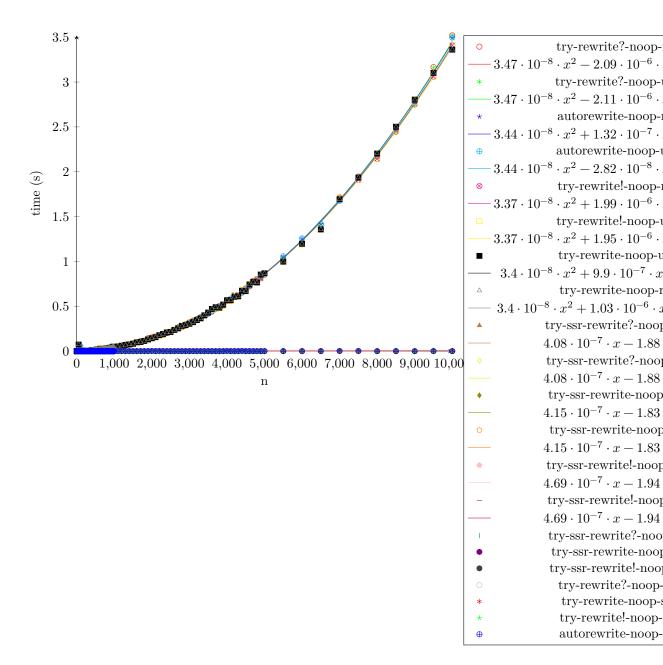


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

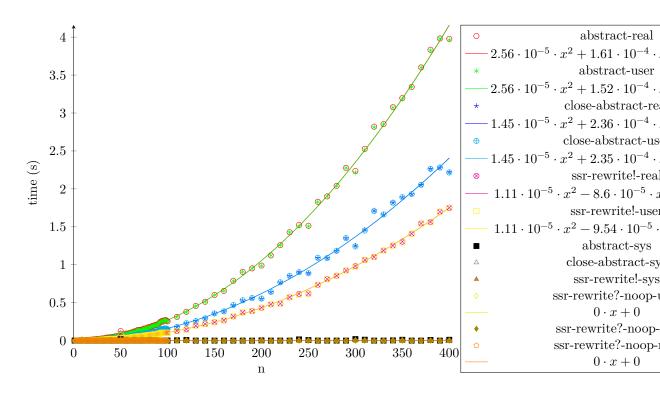


Figure 8: timing-rewrite-repeated-app-ssrrewrite

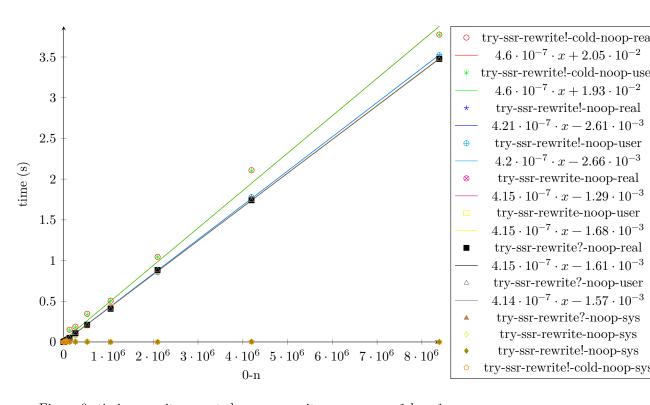


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

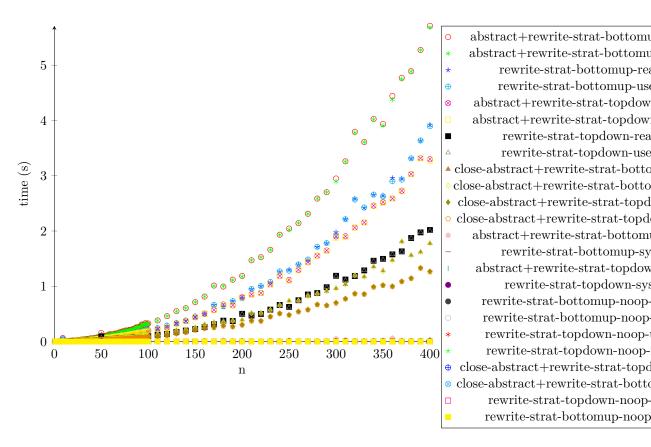


Figure 10: timing-rewrite-repeated-app-rewrite-strat

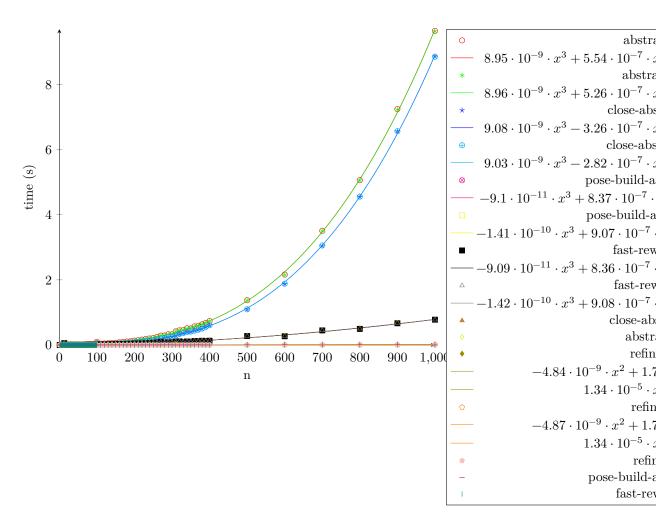
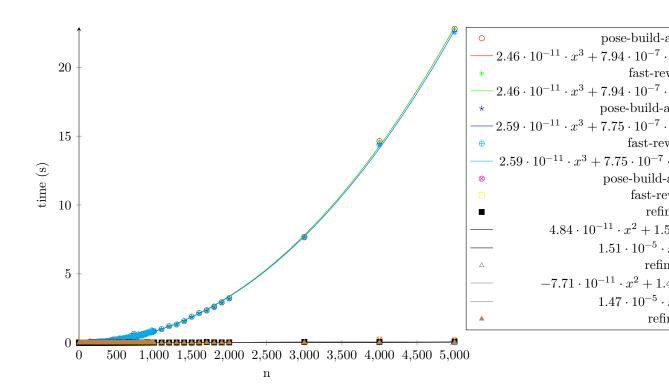
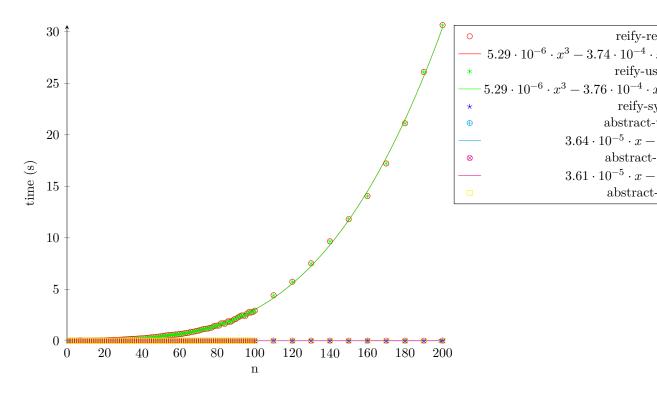


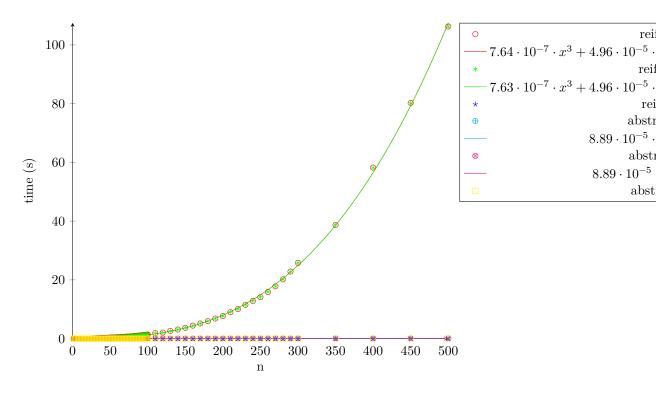
Figure 11: timing-rewrite-repeated-app-fast-rewrite



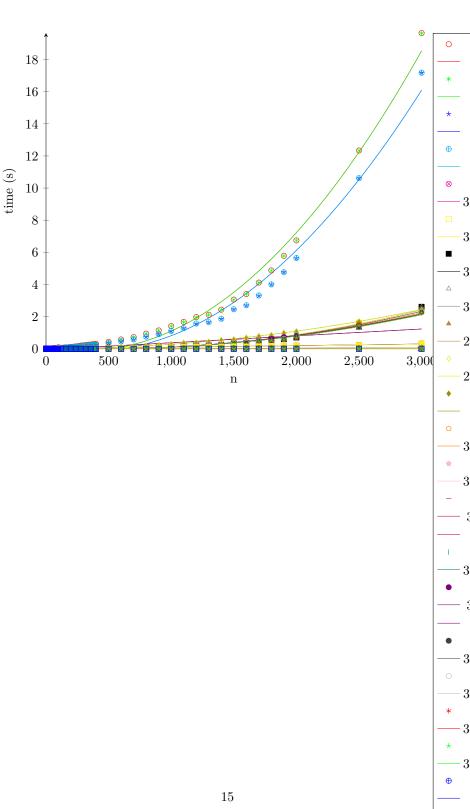
Figure~12:~timing-rewrite-repeated-app-fast-rewrite-no-abstract



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



 ${\bf Figure~14:~timing-type class-reification-let-in-PHOAS}$



 $2.59 \cdot 10^{-6} \cdot x^2 - 1.65 \cdot 10^{-6}$ $2.59 \cdot 10^{-6} \cdot x^2 - 1.66 \cdot 10^{-6}$ $2.33 \cdot 10^{-6} \cdot x^2 - 1.67 \cdot 10^{-6}$ $2.33 \cdot 10^{-6} \cdot x^2 - 1.68 \cdot 10^{-6}$ $3.73 \cdot 10^{-7} \cdot x^2 - 3.23 \cdot 10^{-4} \cdot x^2$ $3.73 \cdot 10^{-7} \cdot x^2 - 3.23 \cdot 10^{-4} \cdot x^2$ $3.59 \cdot 10^{-7} \cdot x^2 - 3.07 \cdot 10^{-4} \cdot x^2$ $3.59 \cdot 10^{-7} \cdot x^2 - 3.07 \cdot 10^{-4} \cdot x^2$ $2.66 \cdot 10^{-7} \cdot x^2 + 1.64 \cdot 10^{-5} \cdot x^2$ $2.65 \cdot 10^{-7} \cdot x^2 + 1.85 \cdot 10^{-5} \cdot x^2$ $3.33 \cdot 10^{-7} \cdot x^2 - 2.6 \cdot 10^{-4} \cdot x^2$ $3.33 \cdot 10^{-7} \cdot x^2 - 2.59 \cdot 10^{-4} \cdot x^2$ $3.14\cdot 10^{-7}\cdot x^2 - 2.27\cdot 10^{-4}\cdot x^2$ $3.12 \cdot 10^{-7} \cdot x^2 - 2.2 \cdot 10^{-4} \cdot x$ $3.14 \cdot 10^{-7} \cdot x^2 - 2.27 \cdot 10^{-4} \cdot x^2$ $3.12 \cdot 10^{-7} \cdot x^2 - 2.2 \cdot 10^{-4} \cdot x$ $3.12 \cdot 10^{-7} \cdot x^2 - 2.38 \cdot 10^{-4} \cdot x^2$ $3.12 \cdot 10^{-7} \cdot x^2 - 2.38 \cdot 10^{-4} \cdot x^2$ $3.17 \cdot 10^{-7} \cdot x^2 - 2.49 \cdot 10^{-4} \cdot x^2$ $3.17 \cdot 10^{-7} \cdot x^2 - 2.49 \cdot 10^{-4} \cdot x^2$

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

check-admit-cast-u

check-admit-cast-r

check-admit-user

check-admit-real

close-abstract-use

close-abstract-rea

type-admit-cast-re

type-admit-cast-us

type-pf-cast-real

refine-real

refine-user

check-pf-cast-rea

type-admit-real

type-admit-user

build-eval-thunk-u

 $9.89 \cdot 10^{-5} \cdot x - 5.42 \cdot$ build-eval-thunk-re $9.92 \cdot 10^{-5} \cdot x - 4.05 \cdot$ build-thunk-user $9.8 \cdot 10^{-5} \cdot x - 5.89 \cdot$ build-thunk-real $9.83 \cdot 10^{-5} \cdot x - 4.46 \cdot$ oboole I man

 $4.28 \cdot 10^{-4} \cdot x - 5.14 \cdot$ type-pf-cast-user

 $4.28 \cdot 10^{-4} \cdot x - 5.13 \cdot$ check-pf-cast-use