

Figure 1: timing-pattern

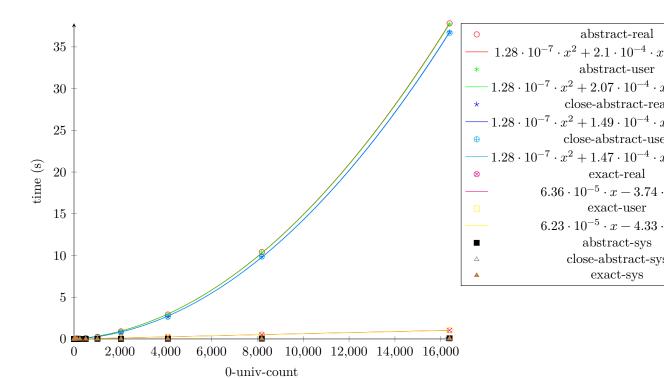


Figure 2: timing-n-polymorphic-universes param-1-n 0

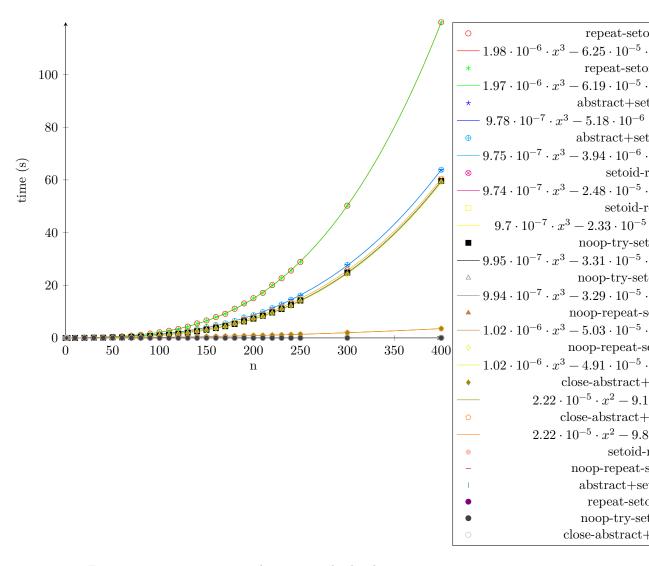
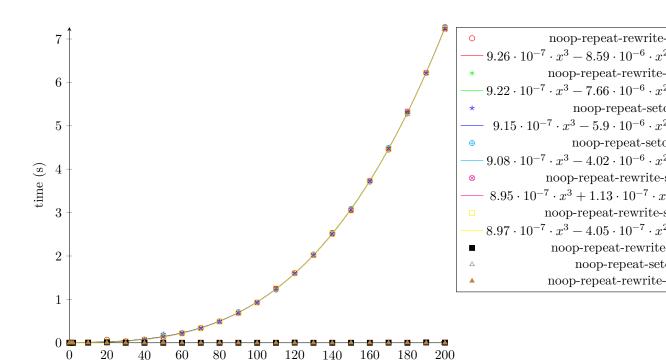


Figure 3: timing-repeat-setoid-rewrite-under-binders



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

n

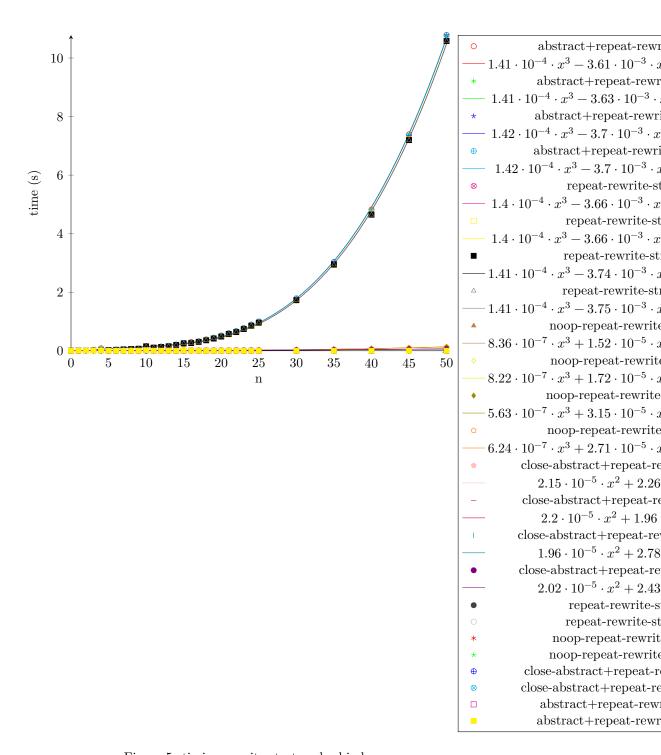
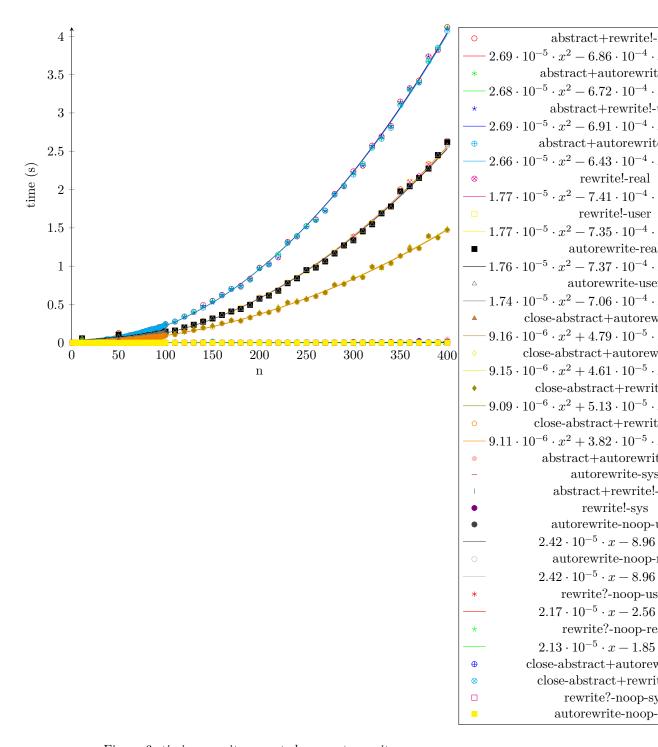


Figure 5: timing-rewrite-strat-under-binders



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

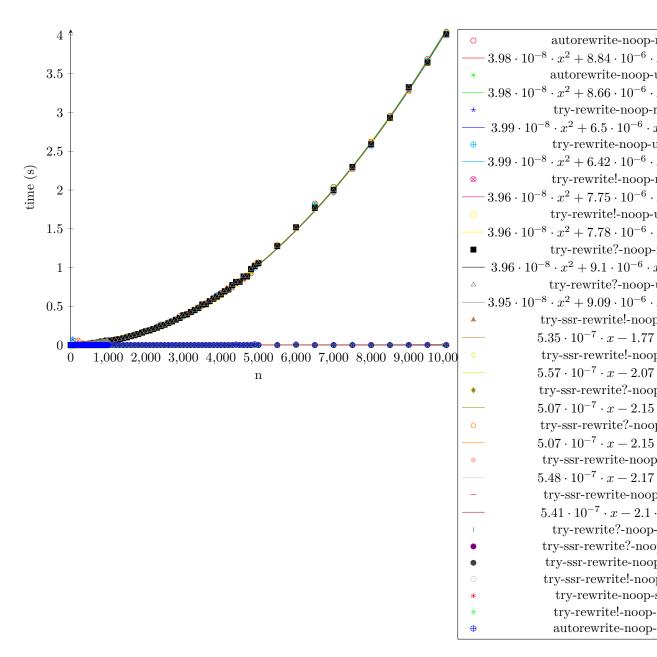
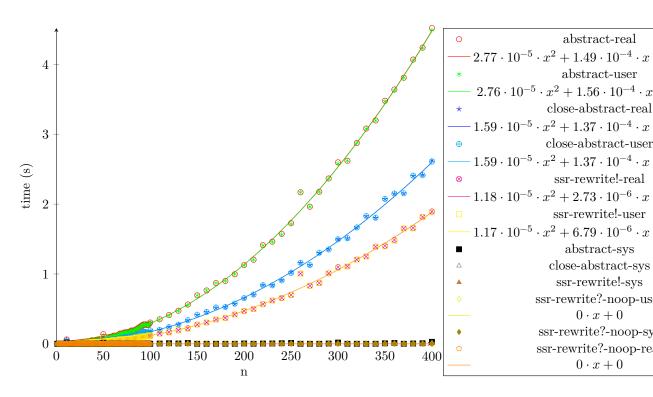


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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

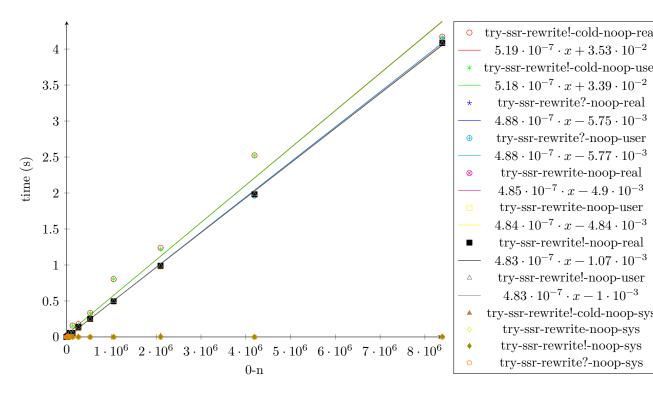


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

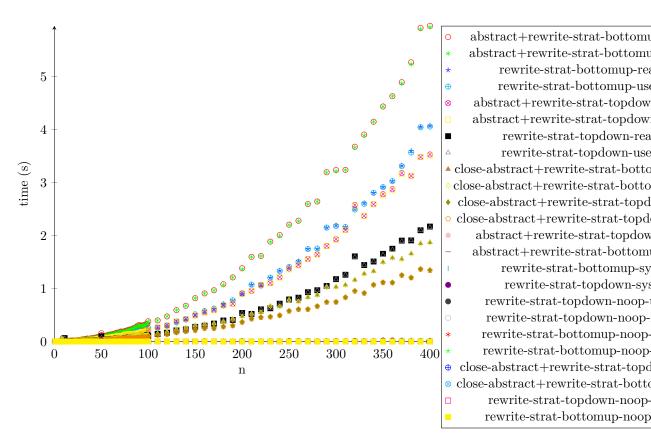
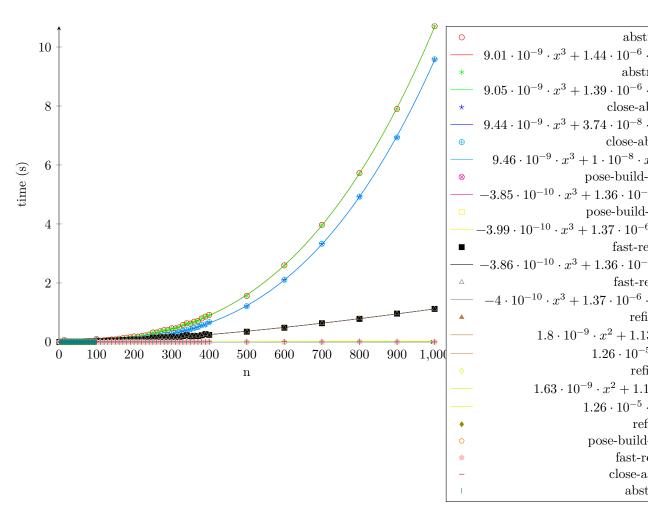


Figure 10: timing-rewrite-repeated-app-rewrite-strat



abst

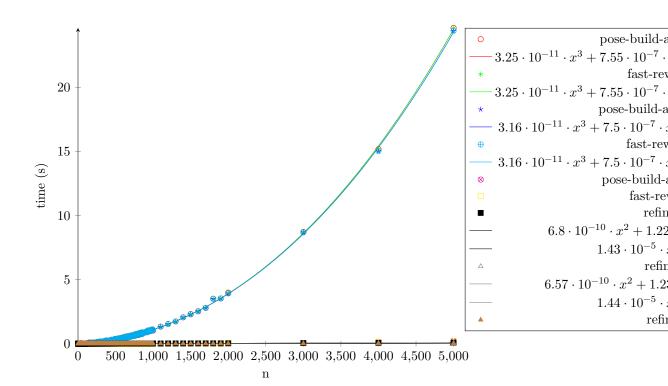
absti

ref

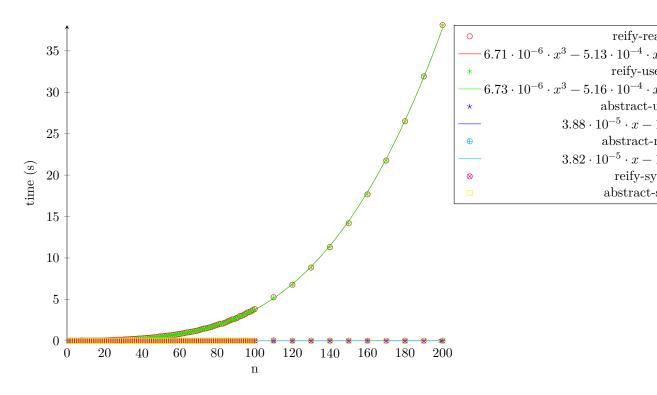
fast-re

abst

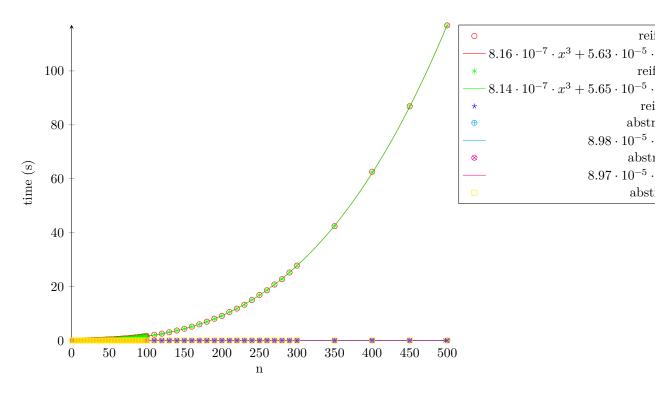
Figure 11: timing-rewrite-repeated-app-fast-rewrite



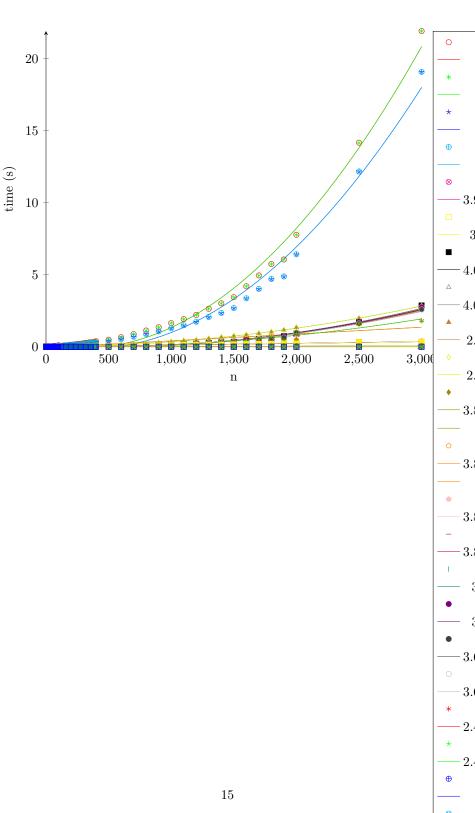
 ${\bf Figure~12:~timing\text{-}rewrite\text{-}repeated\text{-}app\text{-}fast\text{-}rewrite\text{-}no\text{-}abstract}}$



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



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



 $2.86 \cdot 10^{-6} \cdot x^2 - 1.69 \cdot 10^{-6}$ $2.86 \cdot 10^{-6} \cdot x^2 - 1.69 \cdot 10^{-6}$ $2.56 \cdot 10^{-6} \cdot x^2 - 1.74 \cdot 10^{-6}$ $2.56 \cdot 10^{-6} \cdot x^2 - 1.74 \cdot 10^{-6}$ $3.95 \cdot 10^{-7} \cdot x^2 - 3.11 \cdot 10^{-4} \cdot x^2$ $3.94 \cdot 10^{-7} \cdot x^2 - 3.1 \cdot 10^{-4} \cdot x^2$ $4.01 \cdot 10^{-7} \cdot x^2 - 3.24 \cdot 10^{-4} \cdot x^2$ $4.01 \cdot 10^{-7} \cdot x^2 - 3.25 \cdot 10^{-4} \cdot x^2$ $2.97 \cdot 10^{-7} \cdot x^2 + 5.16 \cdot 10^{-5}$ $2.97 \cdot 10^{-7} \cdot x^2 + 5.09 \cdot 10^{-5}$ $3.89 \cdot 10^{-7} \cdot x^2 - 3.36 \cdot 10^{-4} \cdot x^2$ $3.89 \cdot 10^{-7} \cdot x^2 - 3.36 \cdot 10^{-4} \cdot x^2$ $3.81 \cdot 10^{-7} \cdot x^2 - 2.97 \cdot 10^{-4} \cdot x^2 = 2.97 \cdot 10^{-4} \cdot x^2 + 2.97 \cdot 10^{-4} \cdot x^2$ $3.81 \cdot 10^{-7} \cdot x^2 - 2.96 \cdot 10^{-4} \cdot x^2$ $3.85 \cdot 10^{-7} \cdot x^2 - 3 \cdot 10^{-4} \cdot x$ $3.85 \cdot 10^{-7} \cdot x^2 - 3 \cdot 10^{-4} \cdot x$ $3.62 \cdot 10^{-7} \cdot x^2 - 2.73 \cdot 10^{-4} \cdot x^2$ $3.61 \cdot 10^{-7} \cdot x^2 - 2.73 \cdot 10^{-4} \cdot x^2$ $2.48 \cdot 10^{-7} \cdot x^2 - 1.01 \cdot 10^{-4} \cdot x^2$ $2.48 \cdot 10^{-7} \cdot x^2 - 1.01 \cdot 10^{-4} \cdot x^2$

abstract-real

abstract-user

fast-rewrite-real

fast-rewrite-user

check-pf-cast-use

check-pf-cast-rea

type-pf-cast-real

type-pf-cast-user

close-abstract-rea

close-abstract-use

 $4.72 \cdot 10^{-4} \cdot x - 5.76 \cdot$ refine-user

 $4.72 \cdot 10^{-4} \cdot x - 5.76 \cdot$ type-admit-cast-us

type-admit-cast-re

type-admit-real

type-admit-user

check-admit-cast-r

check-admit-cast-u

check-admit-real

check-admit-user

build-eval-thunk-re

 $1.19 \cdot 10^{-4} \cdot x - 4.38 \cdot$ build-thunk-real $1.18 \cdot 10^{-4} \cdot x - 5.32 \cdot$ build-eval-thunk-u $1.19 \cdot 10^{-4} \cdot x - 6 \cdot 1$ build-thunk-user $1.18 \cdot 10^{-4} \cdot x - 7.09 \cdot$ obools I secon

refine-real