

Figure 1: timing-pattern

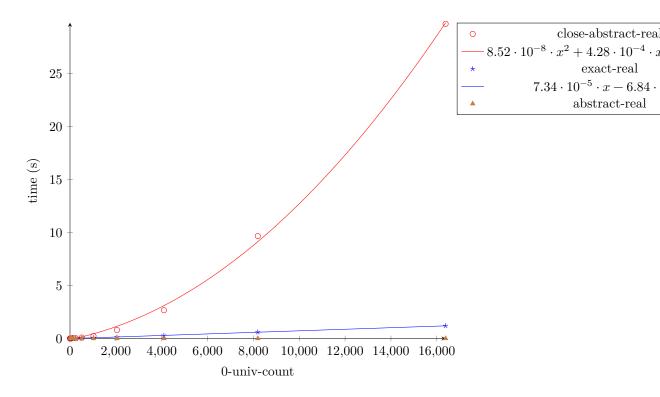


Figure 2: timing-n-polymorphic-universes param-1-n  $\,0\,$ 

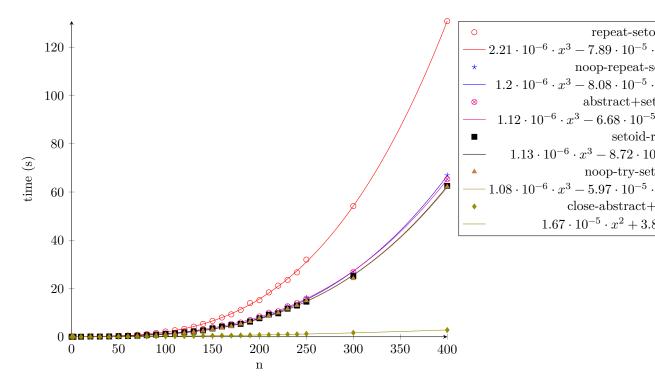


Figure 3: timing-repeat-setoid-rewrite-under-binders

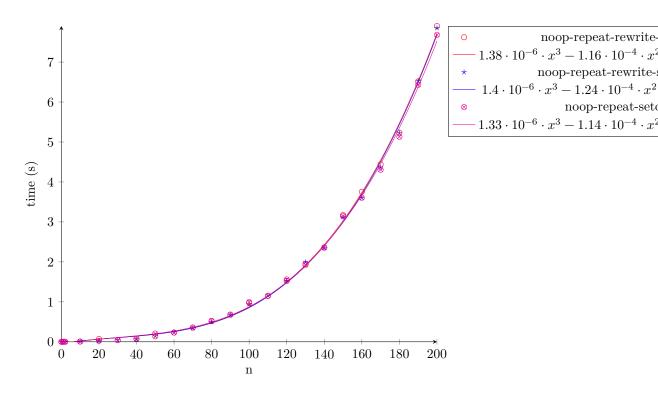
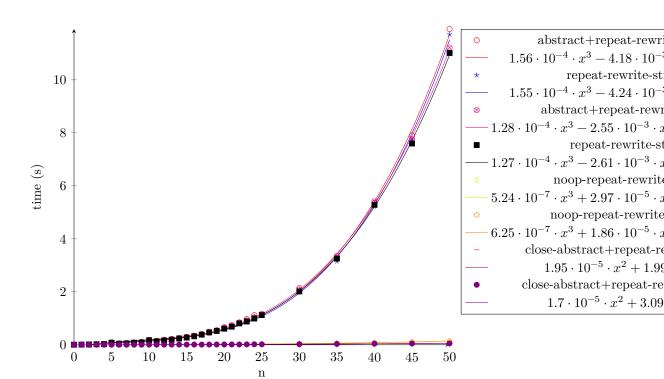
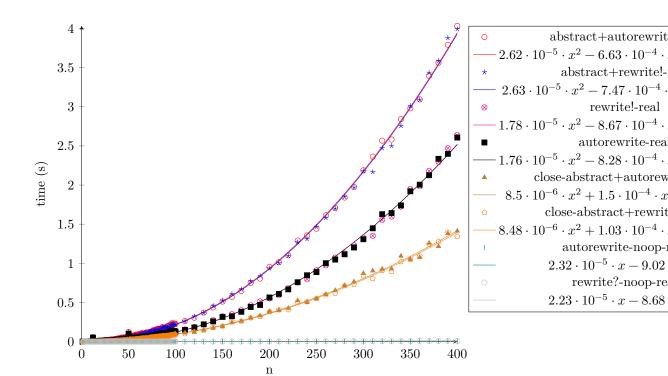


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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



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

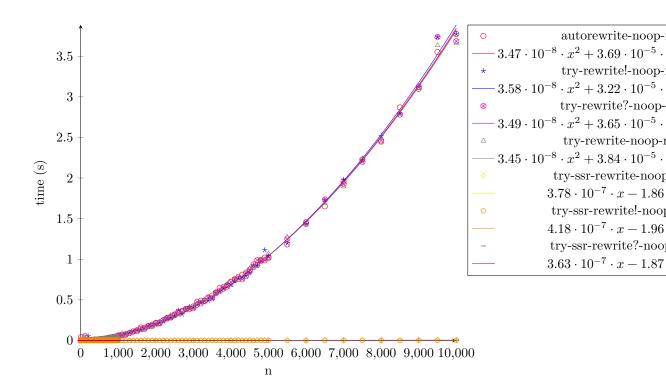
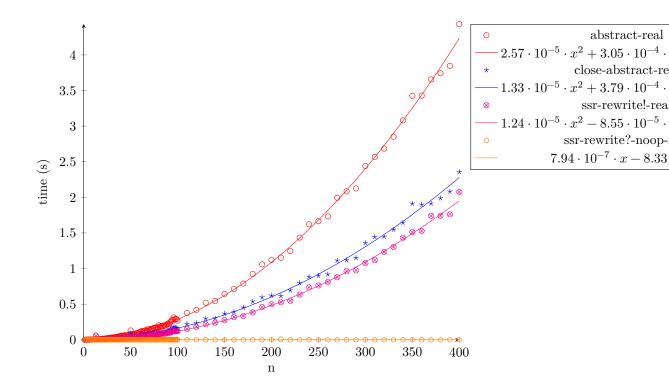
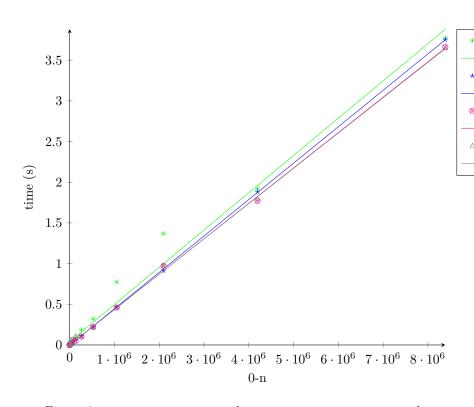


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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



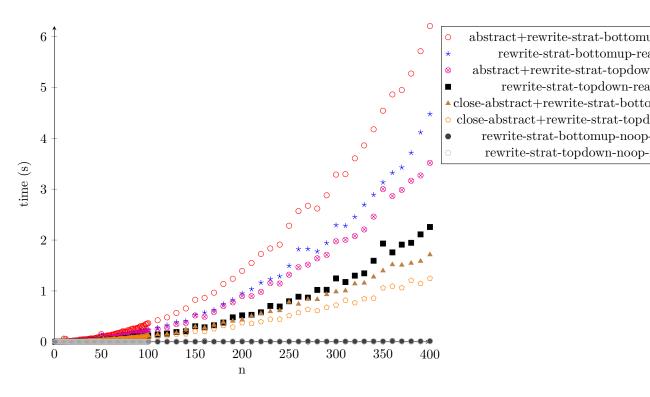
try-ssr-rewrite!-cold-noop-rea $4.58\cdot 10^{-7}\cdot x + 3.96\cdot 10^{-2}$ 

try-ssr-rewrite?-noop-real  $4.47\cdot 10^{-7}\cdot x - 2.2\cdot 10^{-3}$ 

try-ssr-rewrite-noop-real  $4.35\cdot 10^{-7}\cdot x + 1.34\cdot 10^{-3}$ 

try-ssr-rewrite!-noop-real  $4.34 \cdot 10^{-7} \cdot x + 2.44 \cdot 10^{-3}$ 

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



rewrite-strat-bottomup-rea abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

rewrite-strat-bottomup-noop-

rewrite-strat-topdown-noop-

 $Figure~10:~timing\mbox{-rewrite-repeated-app-rewrite-strat}$ 

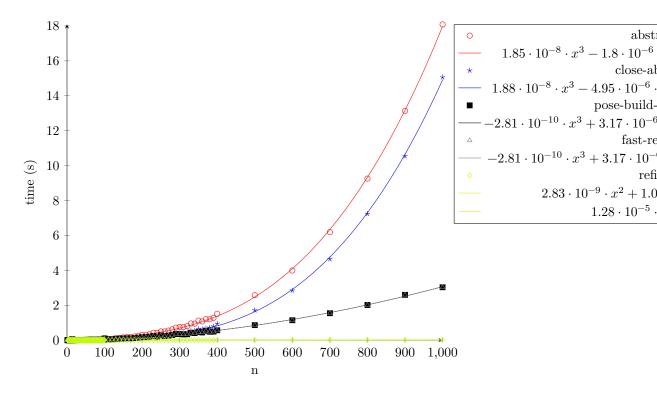
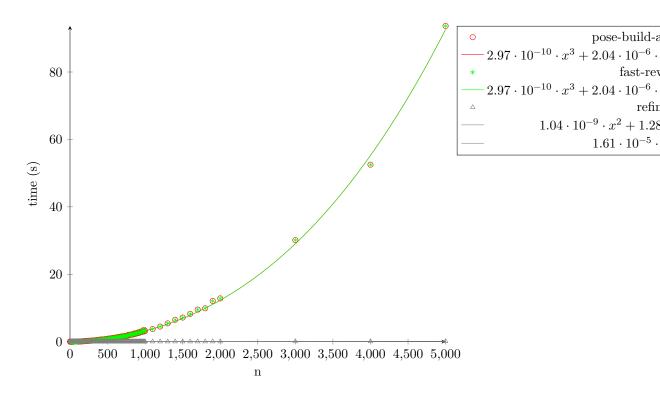


Figure 11: timing-rewrite-repeated-app-fast-rewrite



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

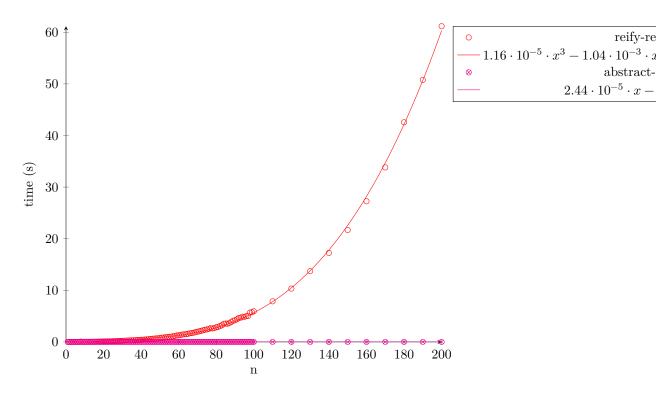
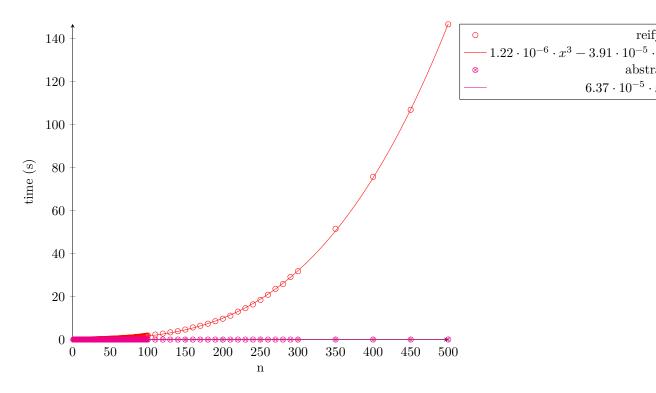


Figure 13: timing-typeclass-reification-let-in-HOAS



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