

Figure 1: timing-pattern

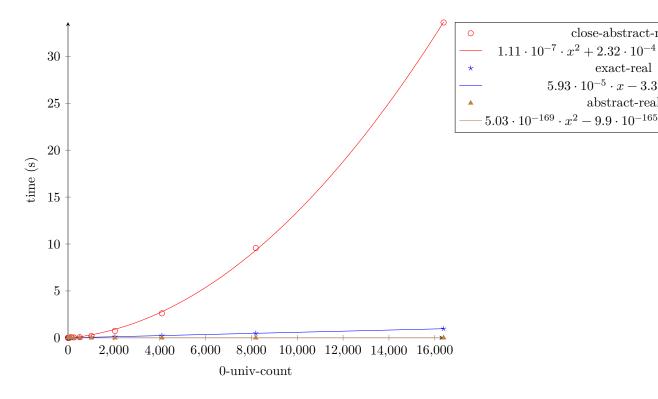
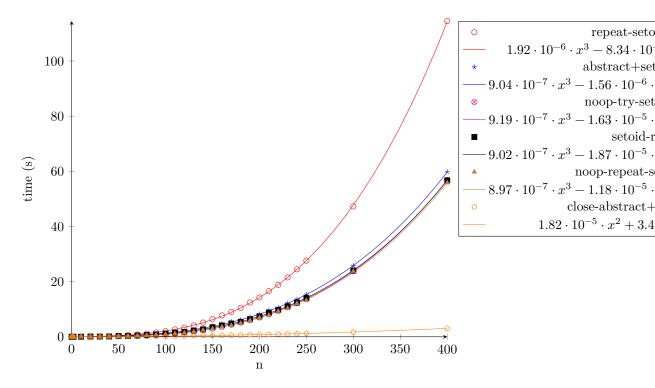
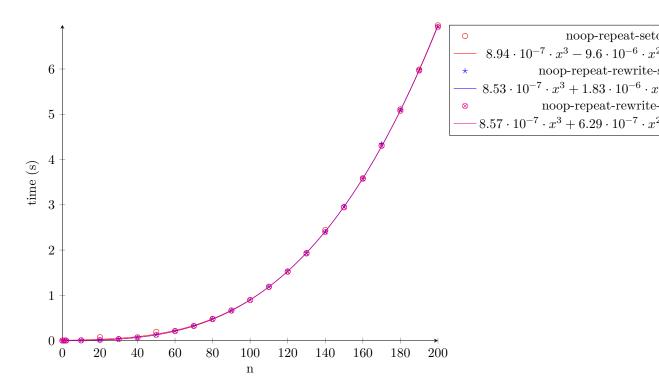


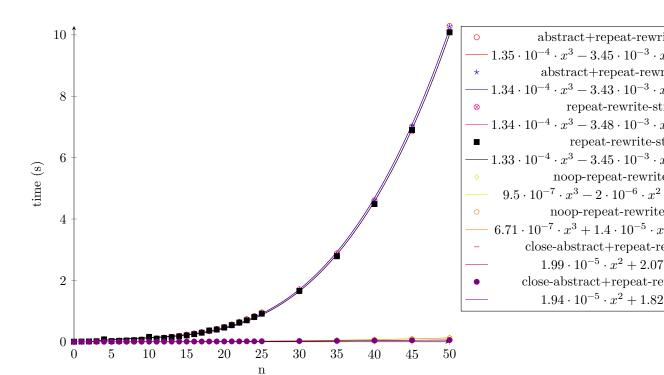
Figure 2: timing-n-polymorphic-universes param-1-n  $\,0\,$ 



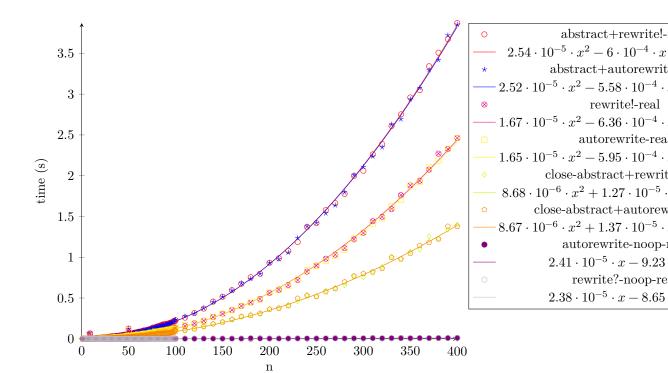
 $Figure \ 3: \ timing-repeat-setoid-rewrite-under-binders$ 



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



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



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

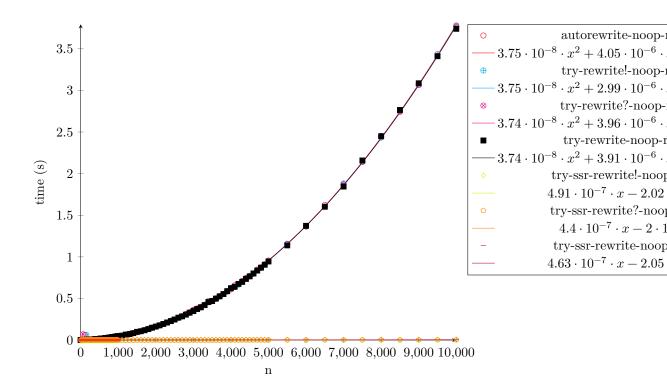


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

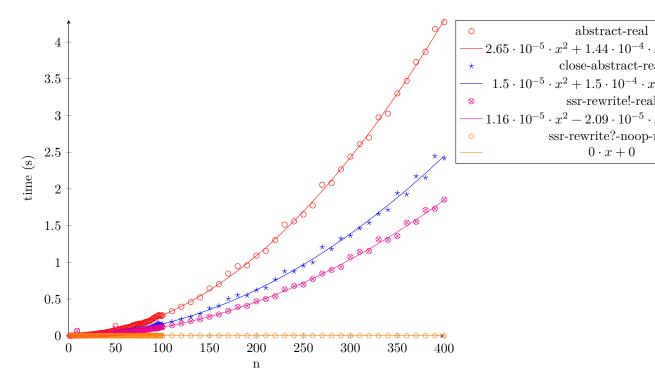
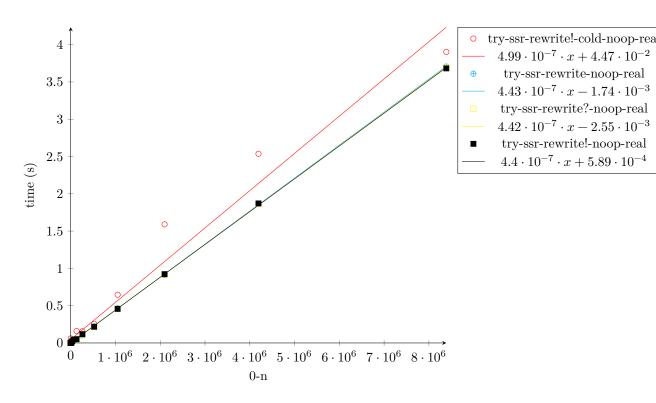


Figure 8: timing-rewrite-repeated-app-ssrrewrite



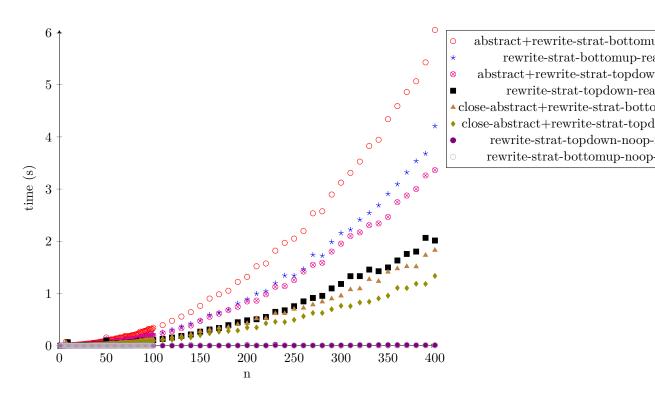
 $4.99 \cdot 10^{-7} \cdot x + 4.47 \cdot 10^{-2}$ try-ssr-rewrite-noop-real

 $4.43\cdot 10^{-7}\cdot x - 1.74\cdot 10^{-3}$ try-ssr-rewrite?-noop-real

 $4.42\cdot 10^{-7}\cdot x - 2.55\cdot 10^{-3}$ try-ssr-rewrite!-noop-real

 $4.4\cdot 10^{-7}\cdot x + 5.89\cdot 10^{-4}$ 

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



rewrite-strat-bottomup-rea abstract + rewrite - strat - topdow

rewrite-strat-topdown-rea

rewrite-strat-topdown-nooprewrite-strat-bottomup-noop-

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

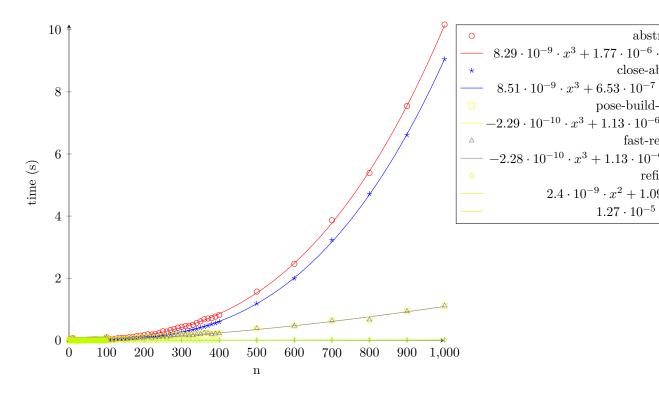
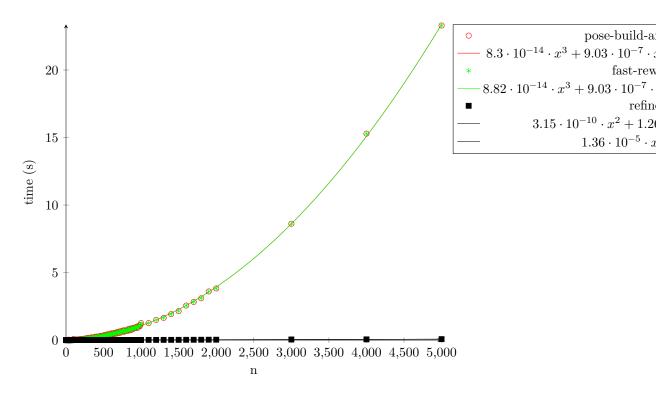


Figure 11: timing-rewrite-repeated-app-fast-rewrite



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

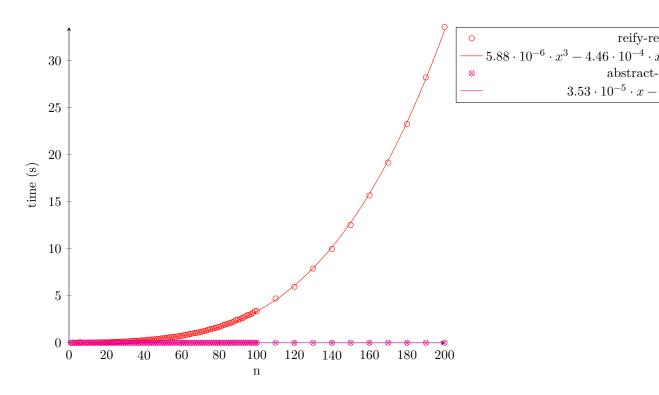
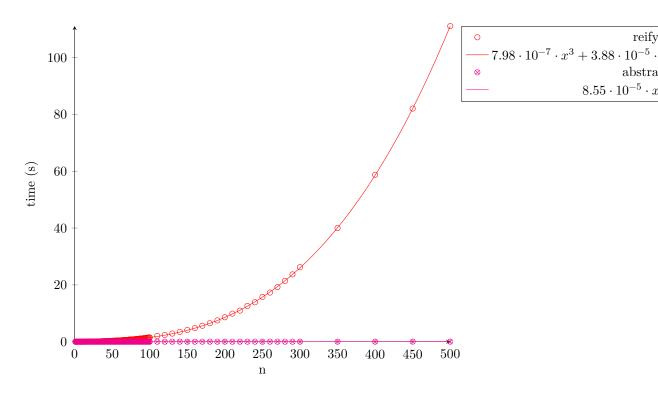


Figure 13: timing-typeclass-reification-let-in-HOAS



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