

Figure 1: timing-pattern

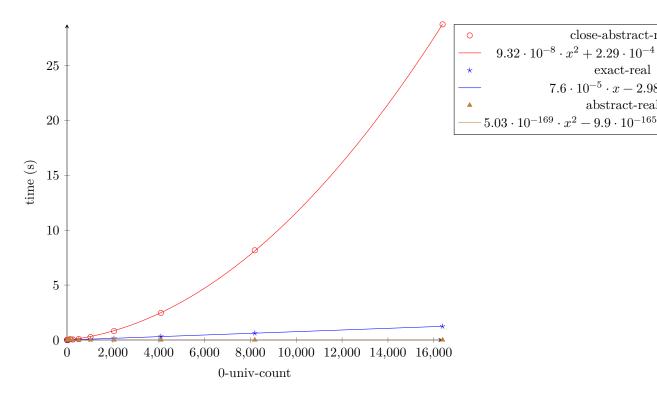
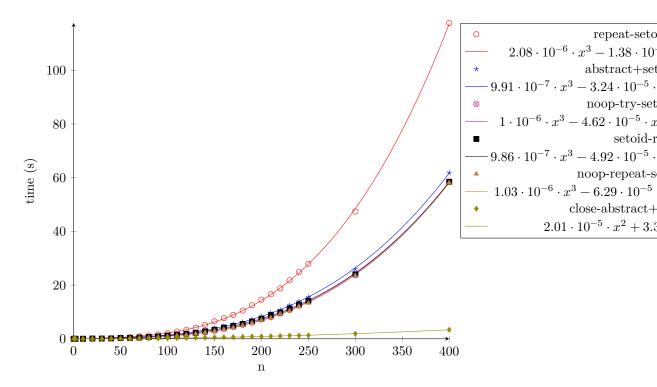


Figure 2: timing-n-polymorphic-universes param-1-n  $\,0\,$ 



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

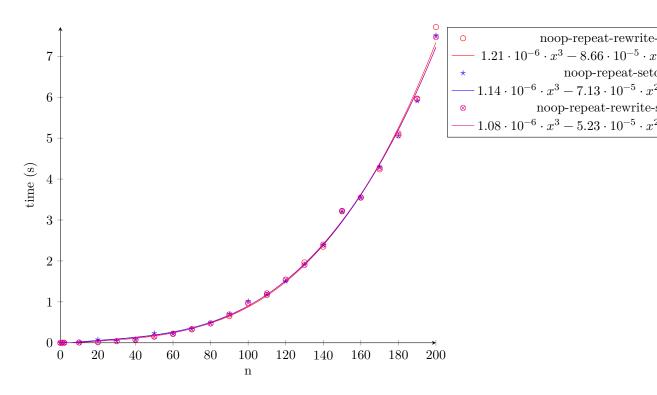
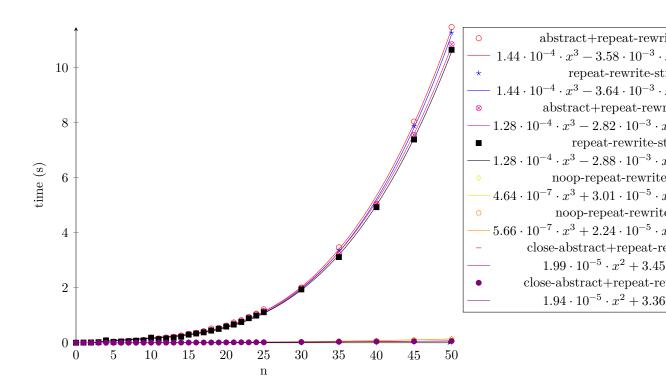
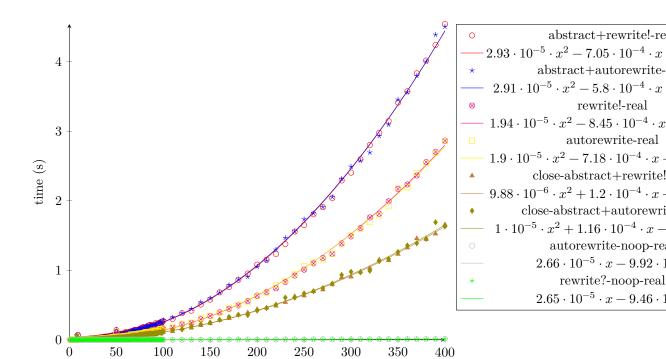


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

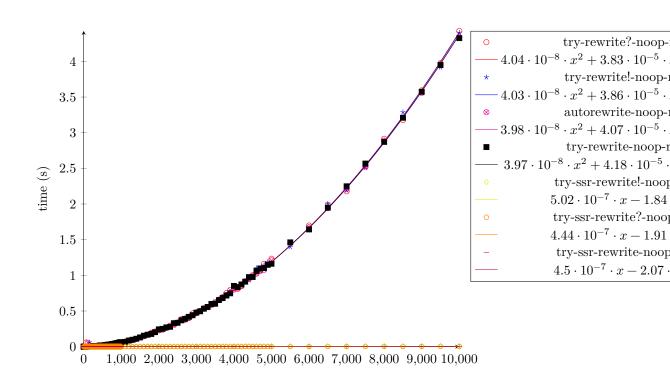


 $Figure\ 5:\ timing-rewrite-strat-under-binders$ 



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

n



 $Figure~7:~timing\mbox{-rewrite-repeated-app-autorewrite-noop}$ 

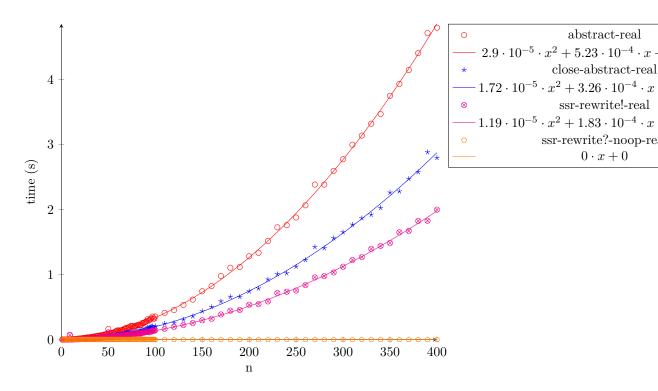
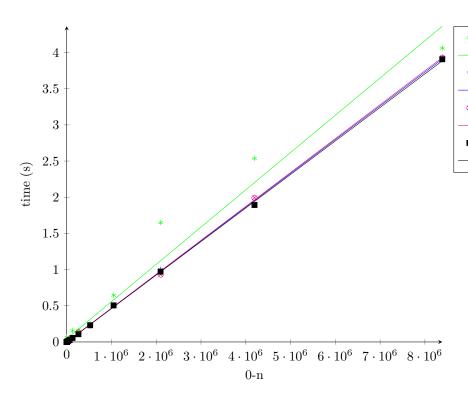


Figure 8: timing-rewrite-repeated-app-ssrrewrite



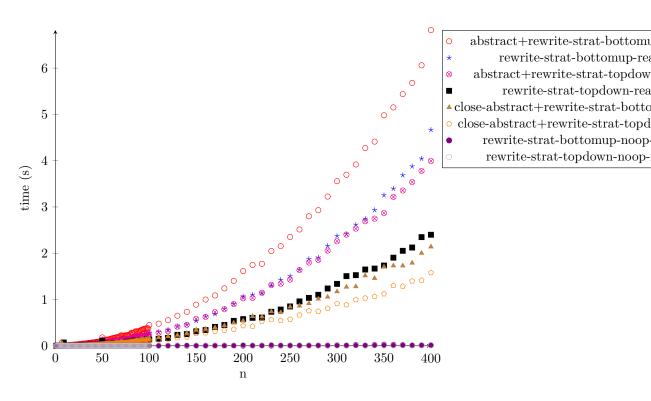
try-ssr-rewrite!-cold-noop-rea $5.15\cdot 10^{-7}\cdot x + 4.27\cdot 10^{-2}$ 

try-ssr-rewrite-noop-real  $4.67\cdot 10^{-7}\cdot x - 2.4\cdot 10^{-3}$ 

try-ssr-rewrite!-noop-real  $4.69\cdot 10^{-7}\cdot x - 7.46\cdot 10^{-4}$ 

try-ssr-rewrite?-noop-real  $4.63\cdot 10^{-7}\cdot x - 2.51\cdot 10^{-3}$ 

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-nooprewrite-strat-topdown-noop-

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

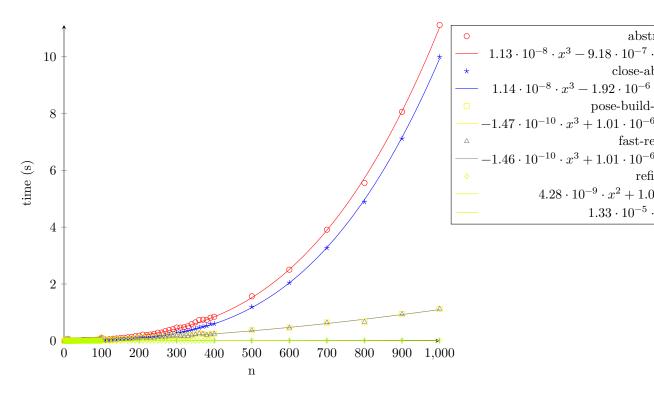
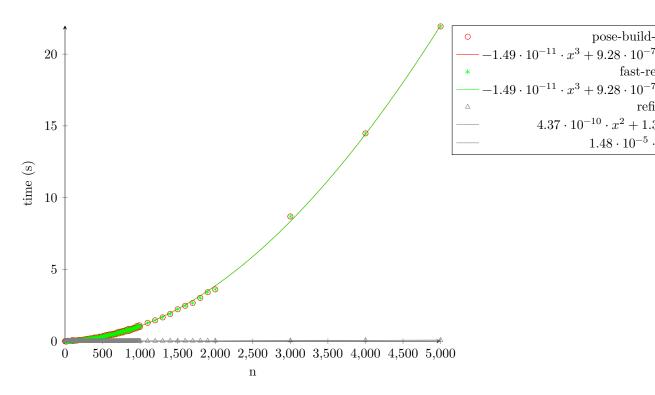


Figure 11: timing-rewrite-repeated-app-fast-rewrite



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

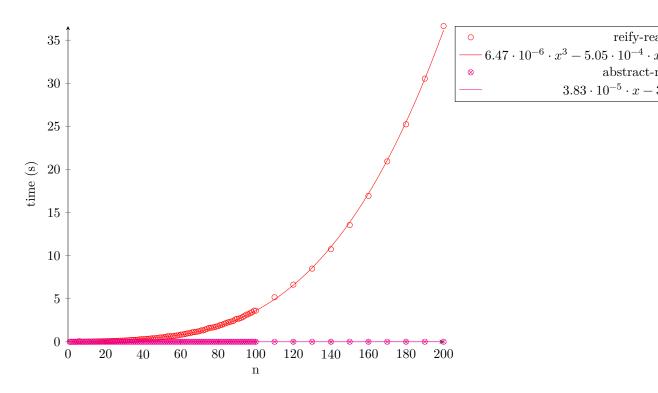


Figure 13: timing-typeclass-reification-let-in-HOAS

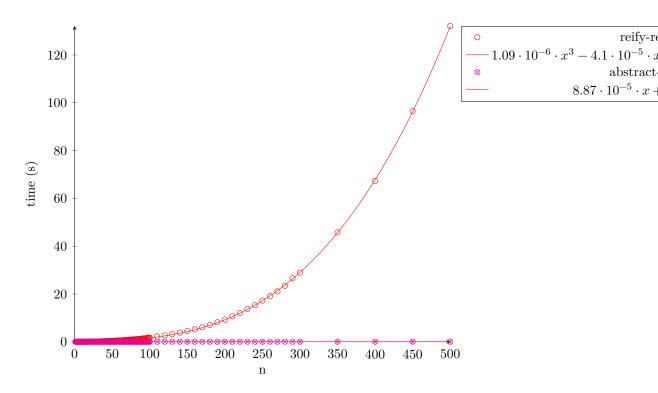


Figure 14: timing-typeclass-reification-let-in-PHOAS