

Figure 1: timing-pattern

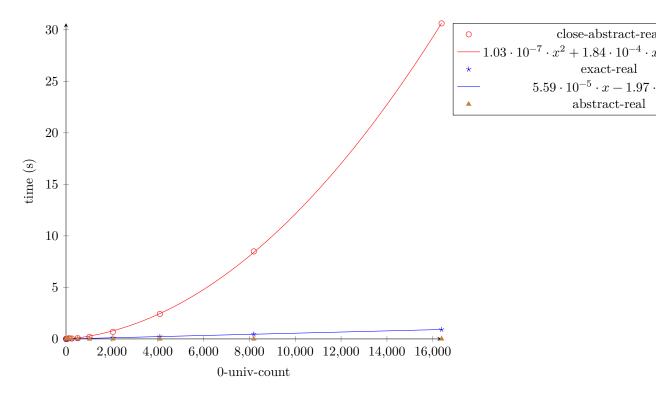
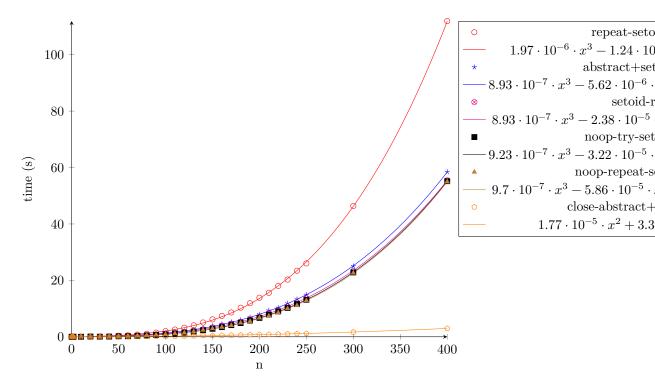


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

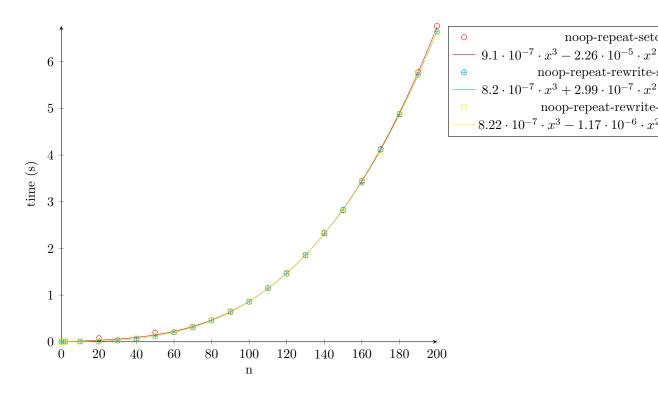
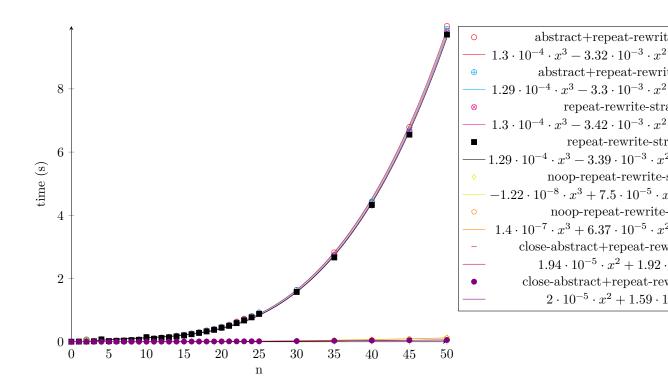
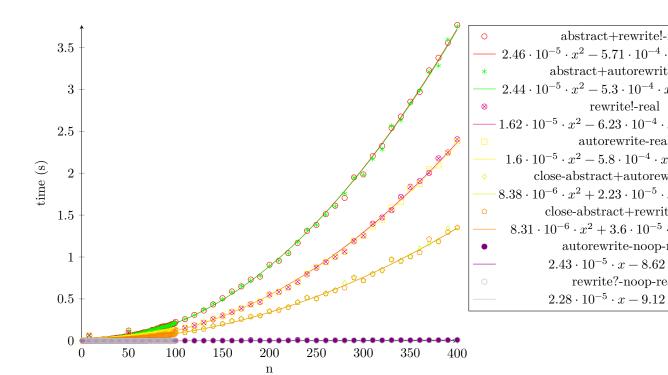


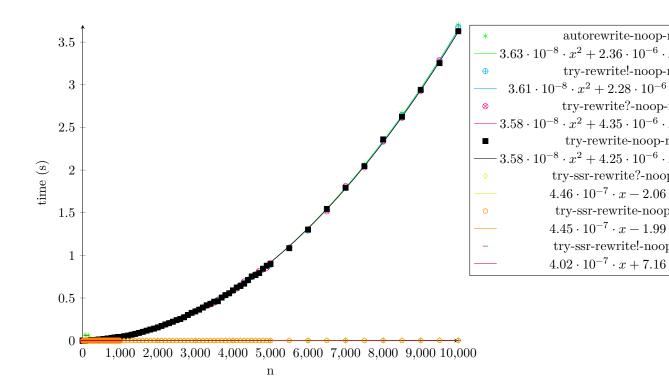
Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



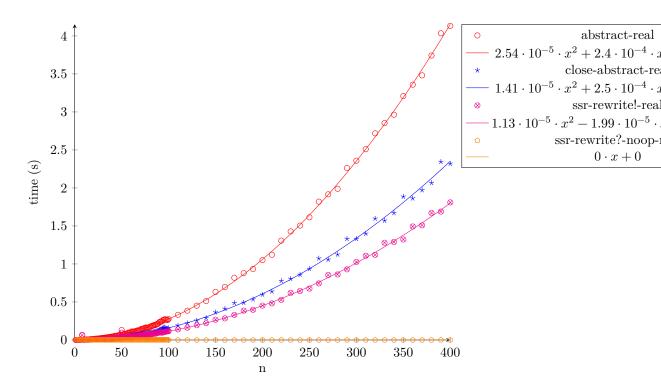
 $Figure\ 5:\ timing-rewrite-strat-under-binders$ 



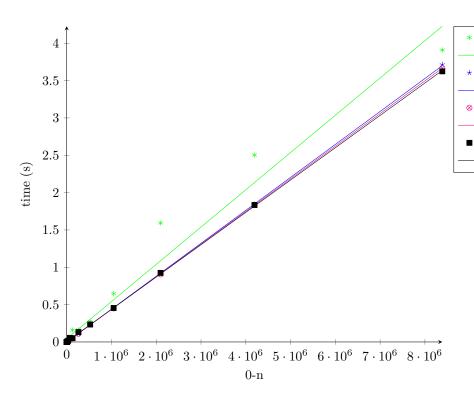
 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$ 



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



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



try-ssr-rewrite!-cold-noop-rea

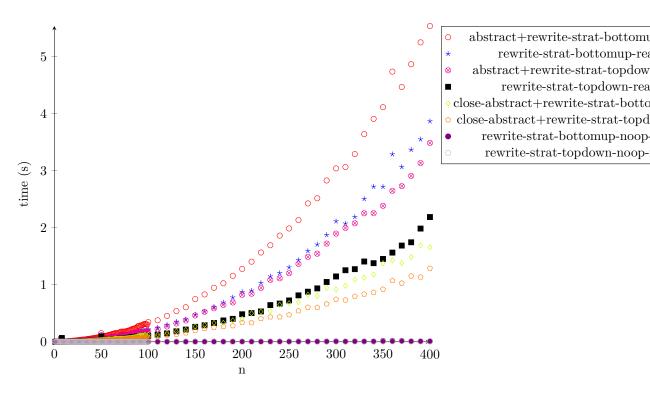
 $4.99 \cdot 10^{-7} \cdot x + 4.2 \cdot 10^{-2}$  try-ssr-rewrite?-noop-real

 $\begin{array}{l} 4.41 \cdot 10^{-7} \cdot x - 2.67 \cdot 10^{-3} \\ \text{try-ssr-rewrite-noop-real} \end{array}$ 

 $\begin{array}{l} 4.37 \cdot 10^{-7} \cdot x - 1.56 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$ 

 $4.33\cdot 10^{-7}\cdot x + 3.28\cdot 10^{-3}$ 

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

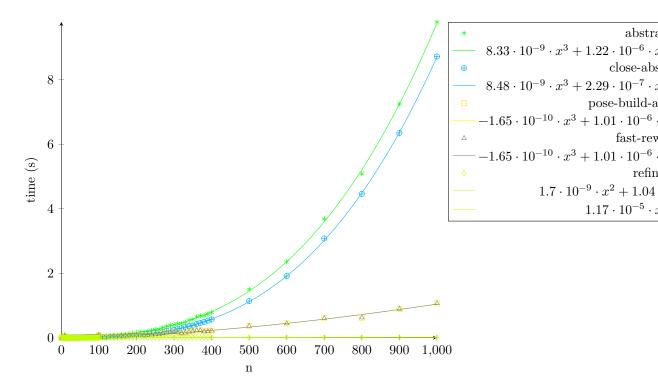


rewrite-strat-bottomup-rea

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

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

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



 $Figure~11:~timing\mbox{-rewrite-repeated-app-fast-rewrite}$ 

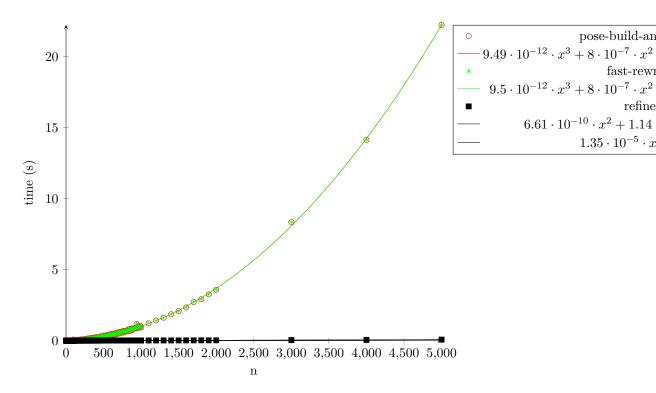


Figure 12: timing-rewrite-repeated-app-fast-rewrite-no-abstract

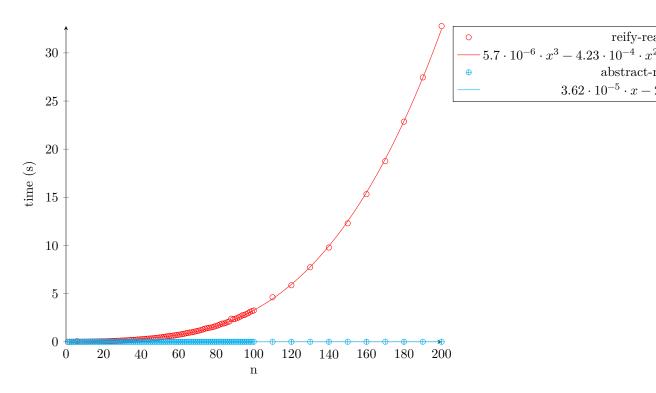


Figure 13: timing-typeclass-reification-let-in-HOAS

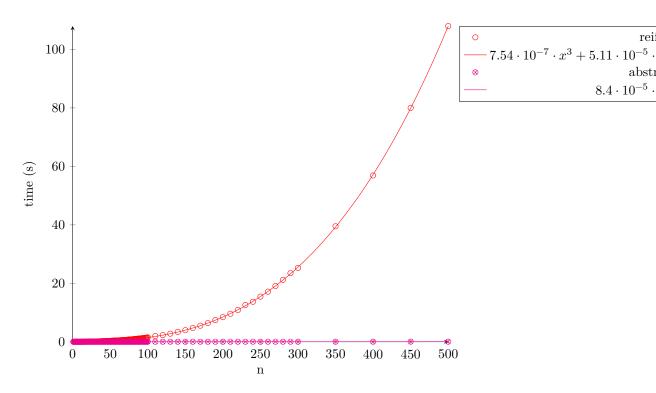
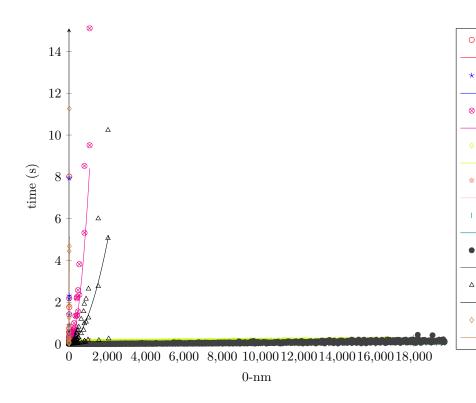


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot

 $7.43\cdot 10^{-6}\cdot x^2 - 2.07\cdot 10^{-4}\cdot x^{-2} + 2.07\cdot 1$ 

 $4.94 \cdot 10^{-11} \cdot x^2 + 5.82 \cdot 10^{-6} \cdot$ 

 $1.18 \cdot 10^{-10} \cdot x^2 + 5.2 \cdot 10^{-6} \cdot$ 

 $1.04 \cdot 10^{-10} \cdot x^2 + 3.52 \cdot 10^{-6} \cdot$ 

 $2.12 \cdot 10^{-10} \cdot x^2 + 4.52 \cdot 10^{-6}$ 

 $1.06 \cdot 10^{-6} \cdot x^2 + 3.37 \cdot 10^{-4} \cdot x^2$ 

 $-6.55 \cdot 10^{-3} \cdot x^3 + 0.21 \cdot x^2 - \\$ 

 $5.14\cdot 10^{-3}\exp\left(0.46\cdot ($  rewrite-strat (topdown-bot)  $5.3\cdot 10^{-3}\exp\left(0.46\cdot ($ 

cps+native-compute

cps+vm-compute-

cps+cbv-real

cps+lazy-real

cps+simpl-real

setoid-rewrite-re

cps+cbn-real

Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

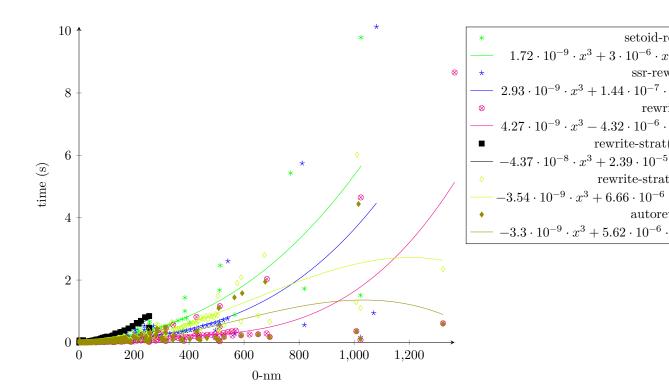
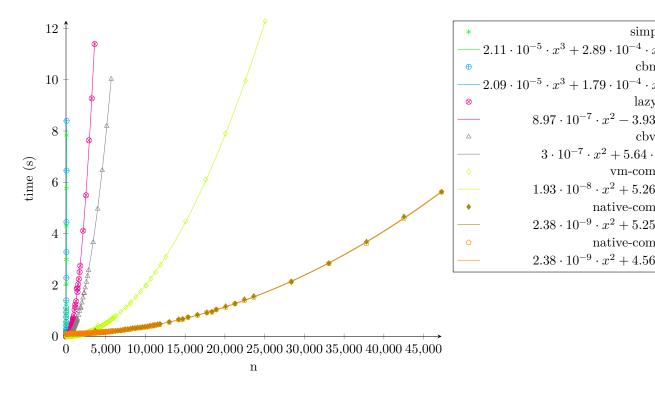


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

 $8.97 \cdot 10^{-7} \cdot x^2 - 3.93$ 

 $3 \cdot 10^{-7} \cdot x^2 + 5.64 \cdot$ 

 $1.93 \cdot 10^{-8} \cdot x^2 + 5.26$ 

 $2.38 \cdot 10^{-9} \cdot x^2 + 5.25$ 

 $2.38 \cdot 10^{-9} \cdot x^2 + 4.56$ 

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Figure 17: timing-sieve-of-eratosthenes

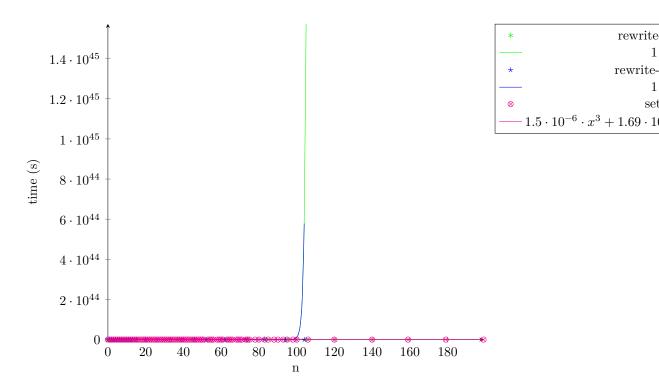


Figure 18: timing-rewrite-under-lets-plus-0  $\,$