

Figure 1: timing-pattern

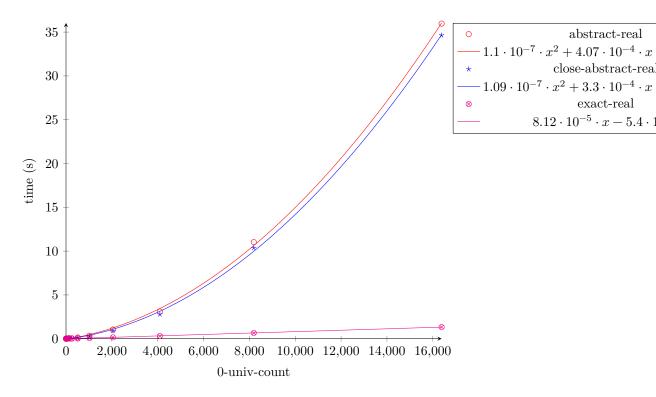
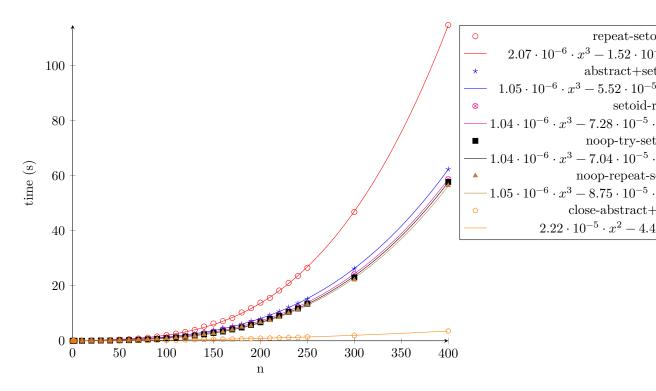


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$



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

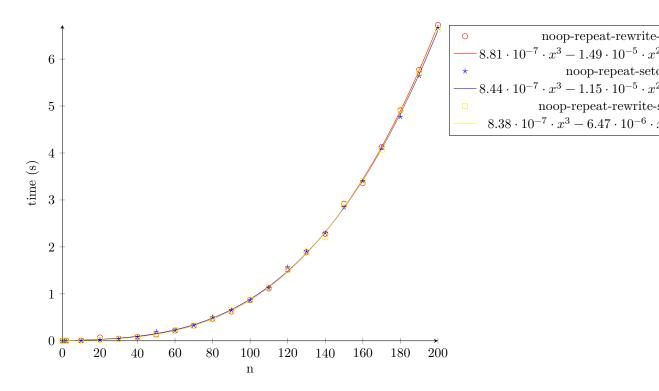
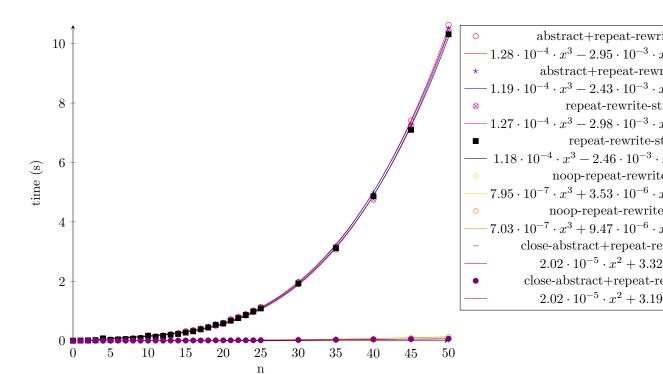
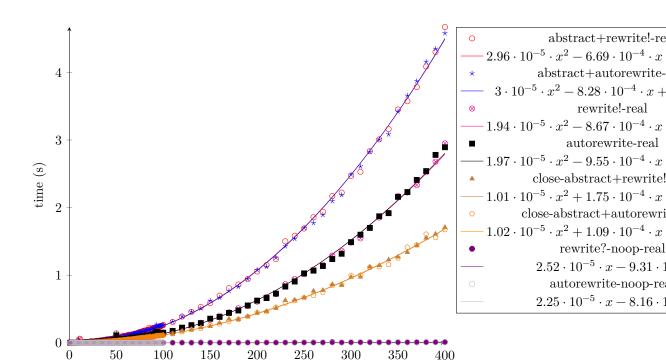


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

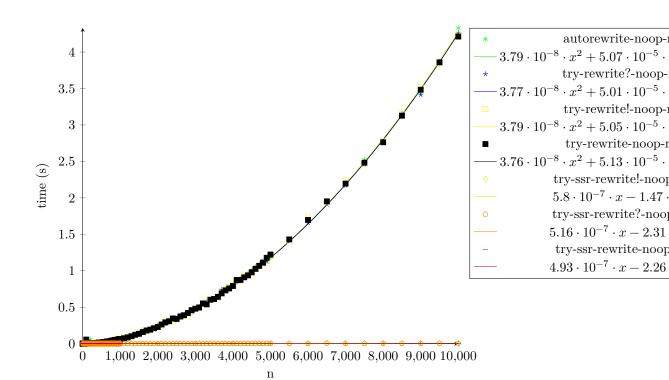


 $Figure\ 5:\ timing-rewrite-strat-under-binders$



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

n



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

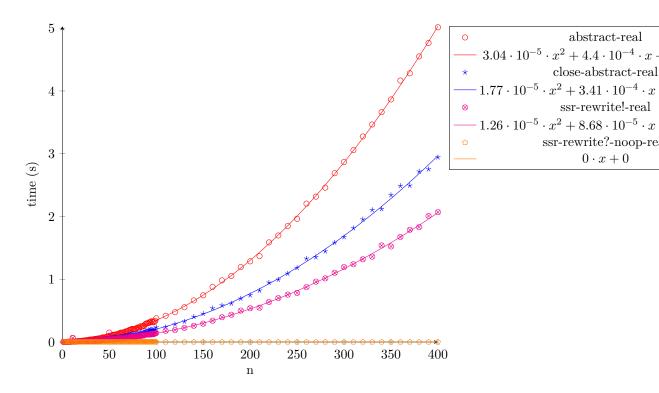


Figure 8: timing-rewrite-repeated-app-ssrrewrite

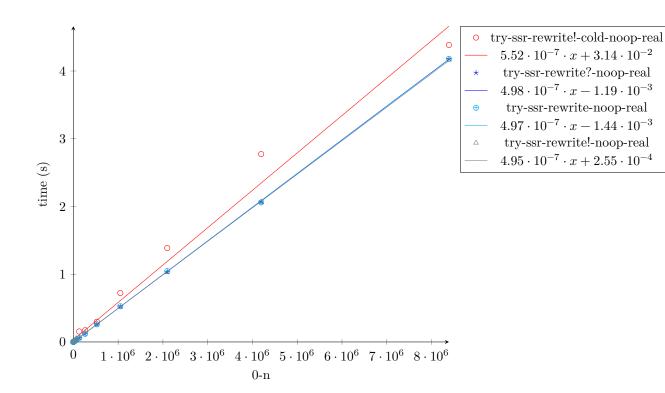
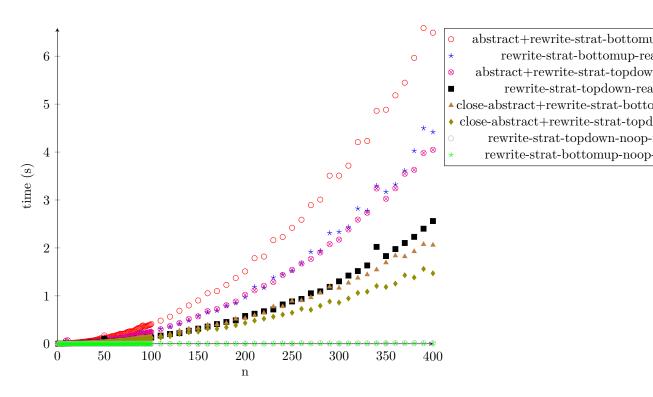


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



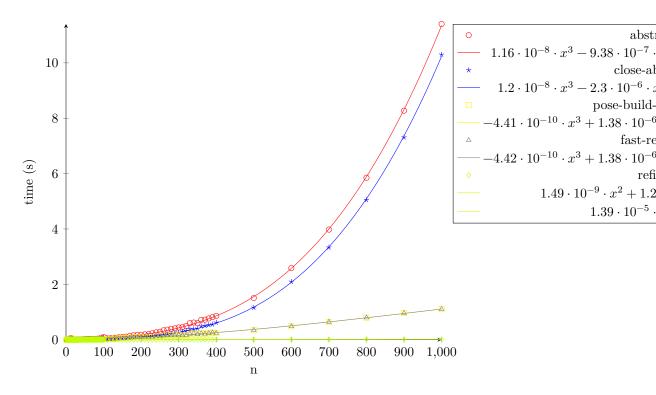
rewrite-strat-bottomup-rea

rewrite-strat-topdown-rea

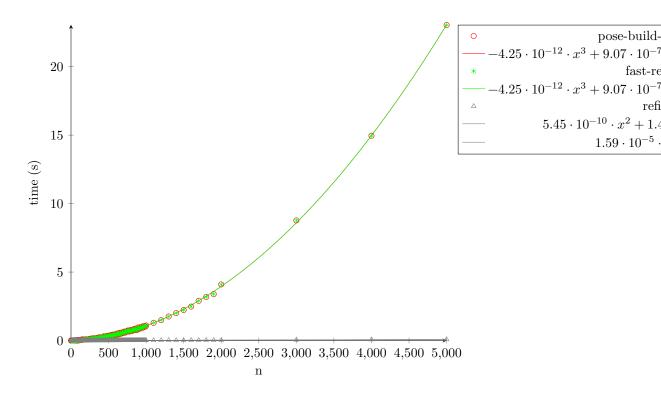
rewrite-strat-topdown-noop-

rewrite-strat-bottomup-noop-

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



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



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

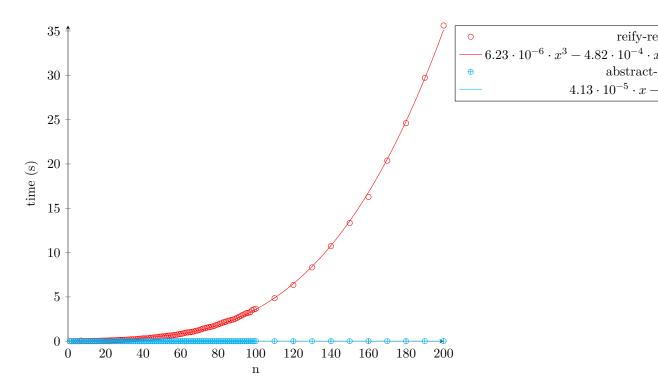


Figure 13: timing-typeclass-reification-let-in-HOAS

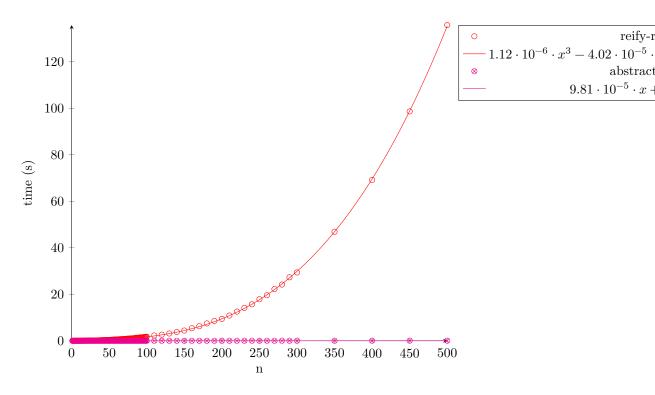


Figure 14: timing-typeclass-reification-let-in-PHOAS

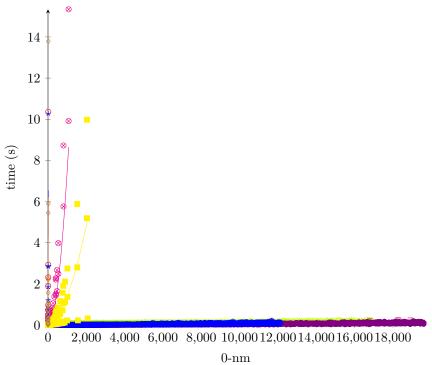


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(bottomup-bot

 $7.53 \cdot 10^{-6} \cdot x^2 - 7.76 \cdot 10^{-5}$

 $1.31\cdot 10^{-10}\cdot x^2 + 5.05\cdot 10^{-6}\cdot \\$

 $2.52 \cdot 10^{-10} \cdot x^2 + 4.34 \cdot 10^{-6} \cdot \\$

 $1.16\cdot 10^{-10}\cdot x^2 + 3.49\cdot 10^{-6}\cdot \\$

 $7.13\cdot 10^{-3}\exp{(0.45\cdot ($ rewrite-strat(topdown-bottop

cps+cbn-real

cps+lazy-real

 $\operatorname{cps+cbv-real}$

cps+vm-compute-

cps+native-compute

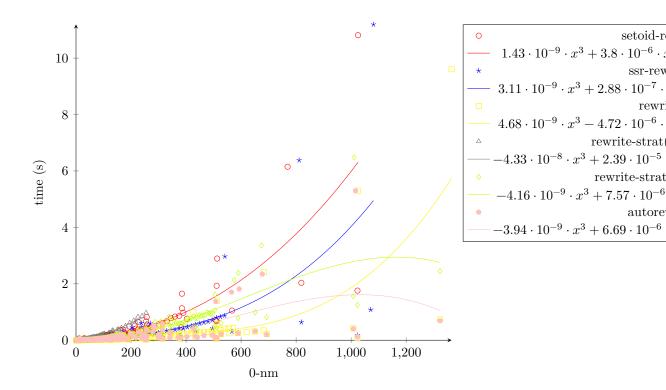
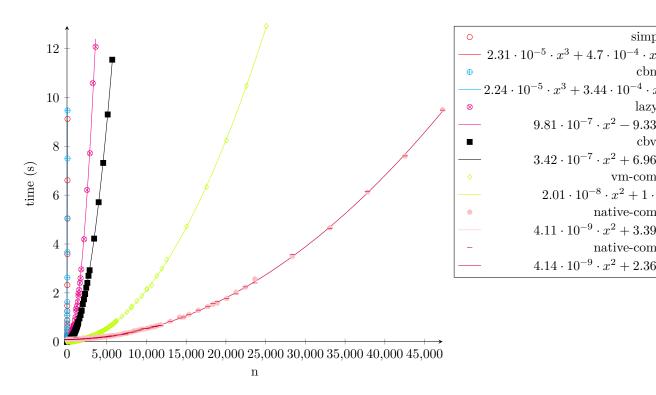


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.81 \cdot 10^{-7} \cdot x^2 - 9.33$

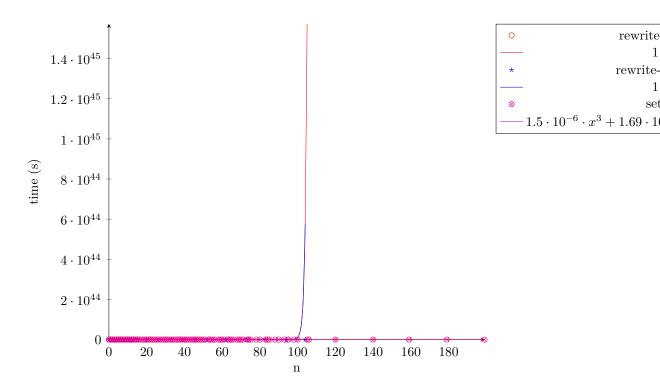
 $3.42 \cdot 10^{-7} \cdot x^2 + 6.96$

 $2.01 \cdot 10^{-8} \cdot x^2 + 1$

 $4.11 \cdot 10^{-9} \cdot x^2 + 3.39$

 $4.14 \cdot 10^{-9} \cdot x^2 + 2.36$

Figure 17: timing-sieve-of-eratosthenes



rewrite

rewrite-

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

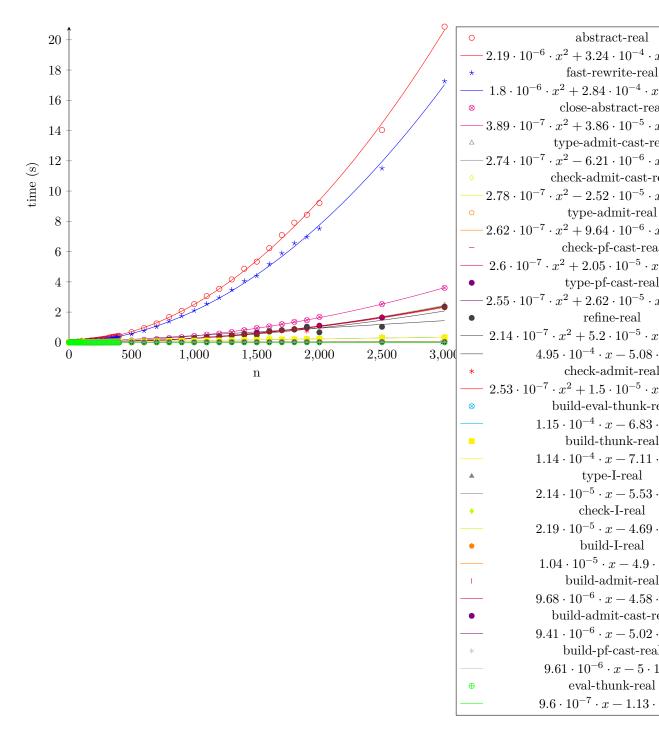


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2