

Figure 1: timing-pattern

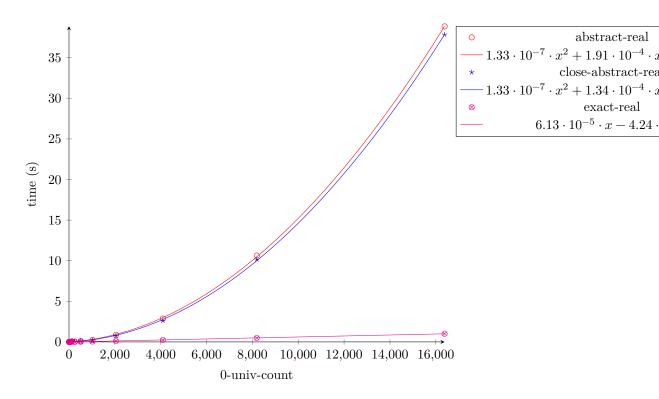


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$

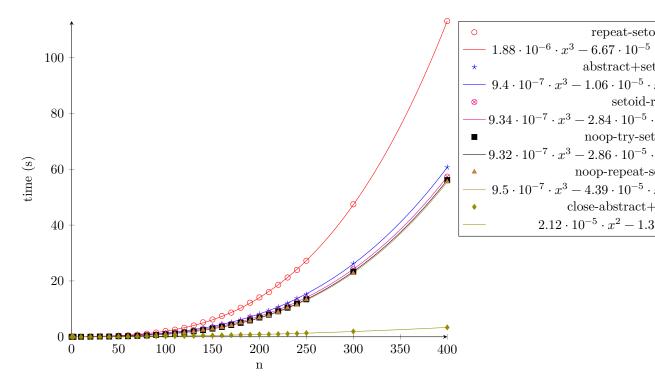


Figure 3: timing-repeat-setoid-rewrite-under-binders

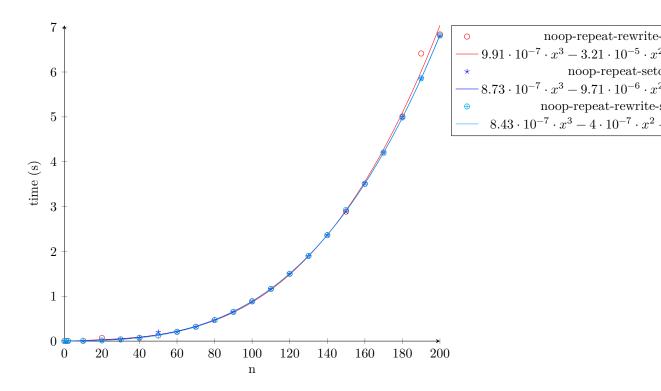
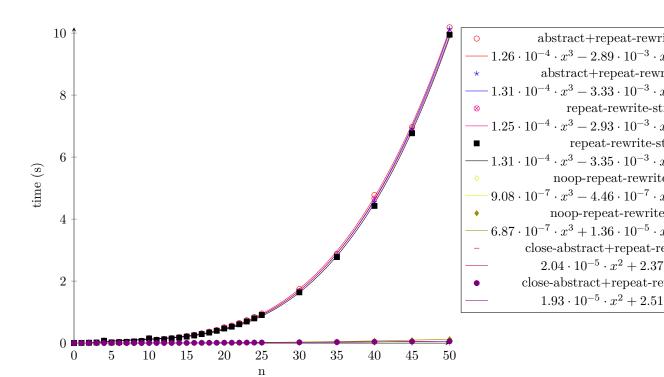
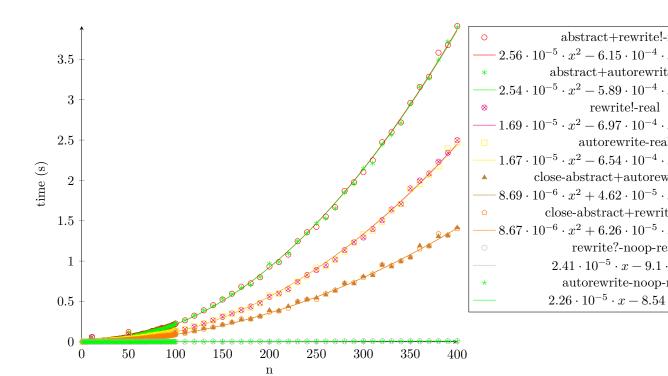


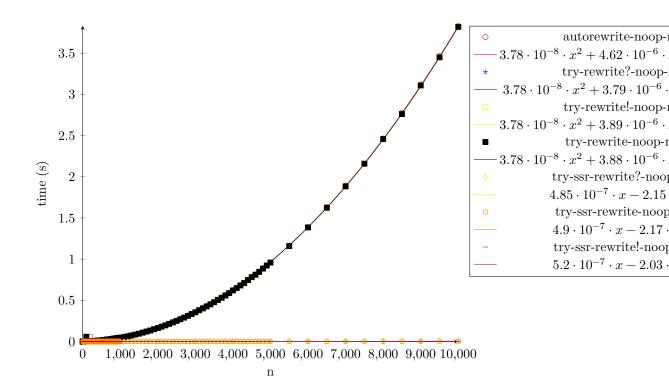
Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



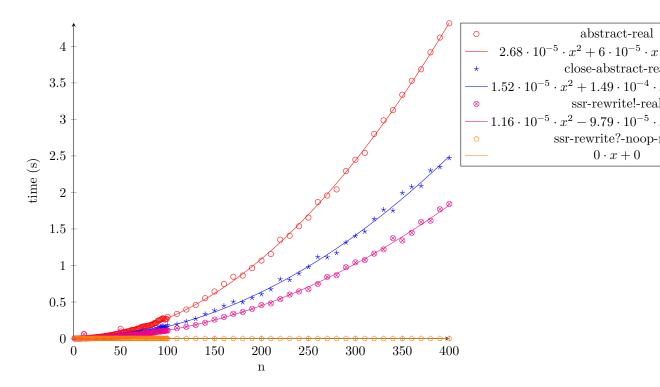
 $Figure\ 5:\ timing-rewrite-strat-under-binders$



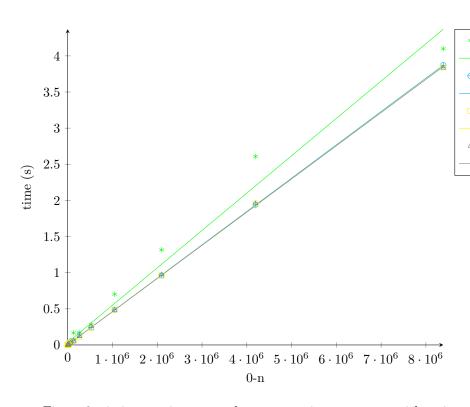
 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$



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



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



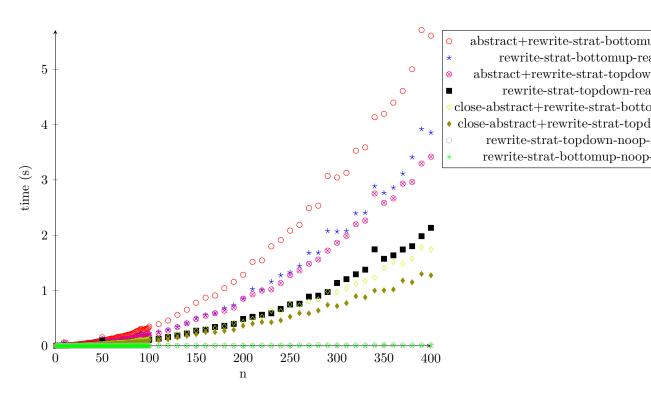
try-ssr-rewrite!-cold-noop-rea $5.17\cdot 10^{-7}\cdot x + 3.32\cdot 10^{-2}$

try-ssr-rewrite!-noop-real $4.61\cdot 10^{-7}\cdot x + 1.53\cdot 10^{-3}$

try-ssr-rewrite?-noop-real $4.6\cdot 10^{-7}\cdot x + 3.54\cdot 10^{-4}$

try-ssr-rewrite-noop-real $4.59 \cdot 10^{-7} \cdot x + 1.74 \cdot 10^{-3}$

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

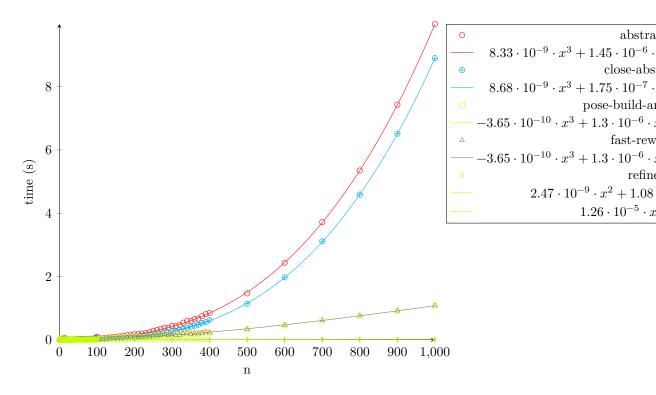


rewrite-strat-bottomup-rea

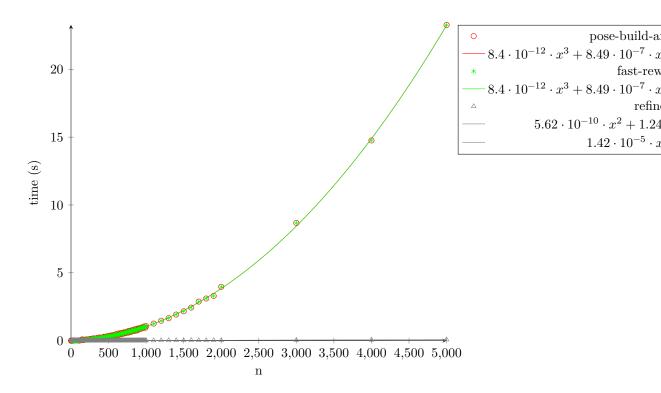
abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

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

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



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



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

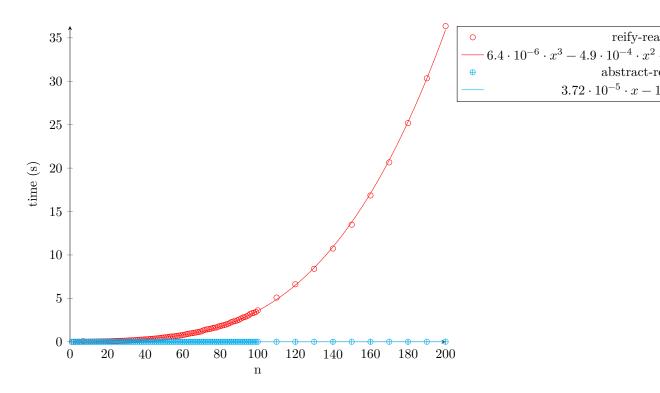
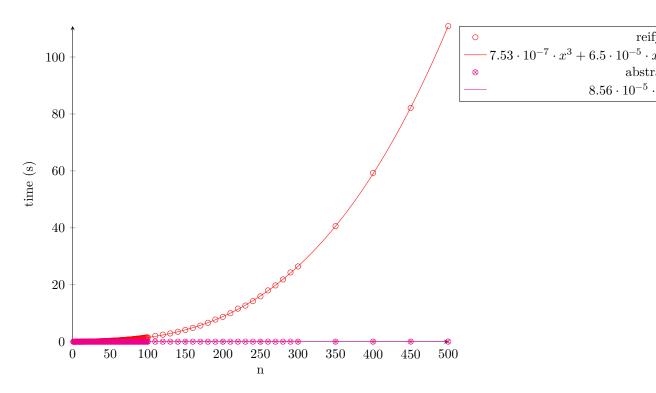
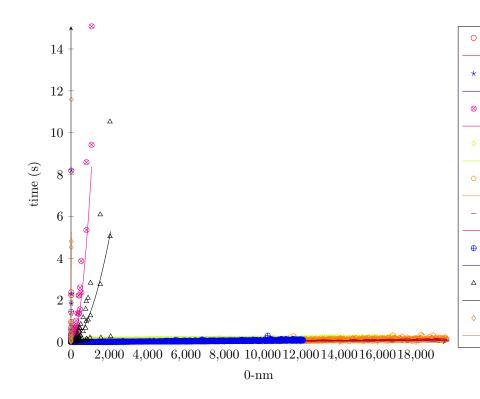


Figure 13: timing-typeclass-reification-let-in-HOAS



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



rewrite-strat(topdown-bot

 $7.33 \cdot 10^{-6} \cdot x^2 - 1.2 \cdot 10^{-4} \cdot x^2$

 $6 \cdot 10^{-11} \cdot x^2 + 5.92 \cdot 10^{-6} \cdot x$

 $2.37 \cdot 10^{-10} \cdot x^2 + 4.14 \cdot 10^{-6} \cdot$

 $1.02\cdot 10^{-10}\cdot x^2 + 3.54\cdot 10^{-6}\cdot \\$

 $1.78 \cdot 10^{-10} \cdot x^2 + 5.76 \cdot 10^{-6} \cdot$

 $1.08 \cdot 10^{-6} \cdot x^2 + 3.38 \cdot 10^{-4} \cdot x^2$

 $-6.69 \cdot 10^{-3} \cdot x^3 + 0.21 \cdot x^2 -$

 $5.45\cdot 10^{-3}\exp\left(0.46\cdot ($ rewrite-strat (bottomup-bot $5.34\cdot 10^{-3}\exp\left(0.46\cdot ($

cps+cbn-real

cps+lazy-real

cps+cbv-real

cps+simpl-real

setoid-rewrite-re

cps+vm-compute-

cps+native-compute

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

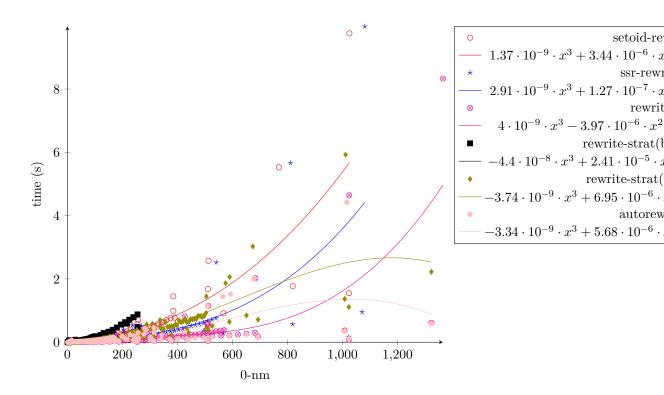
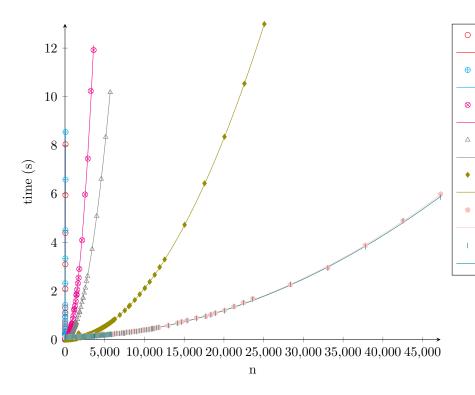


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-comp

native-comp

 $2.09 \cdot 10^{-5} \cdot x^3 + 3.73 \cdot 10^{-4} \cdot x^3$

 $2.15 \cdot 10^{-5} \cdot x^3 + 1.69 \cdot 10^{-4}$

 $9.69 \cdot 10^{-7} \cdot x^2 - 1.32$

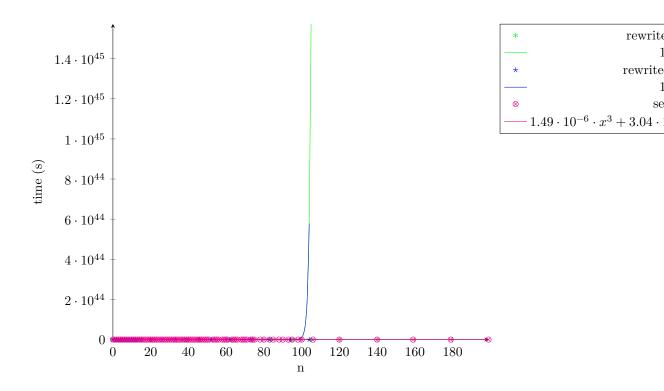
 $3.05 \cdot 10^{-7} \cdot x^2 + 5.68$

 $2.04 \cdot 10^{-8} \cdot x^2 + 5.18$

 $2.51 \cdot 10^{-9} \cdot x^2 + 5.52$

 $2.49 \cdot 10^{-9} \cdot x^2 + 5.17$

Figure 17: timing-sieve-of-eratosthenes



rewrite

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

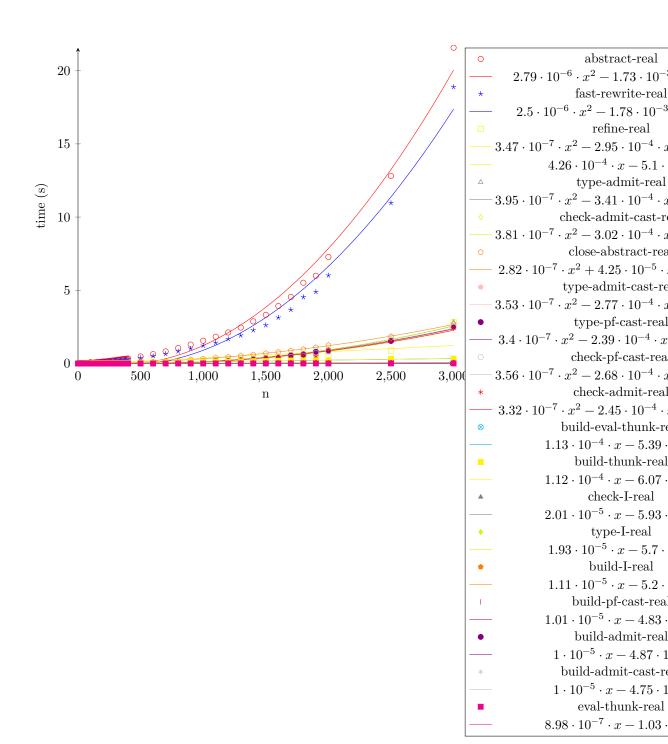


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2