

Figure 1: timing-pattern

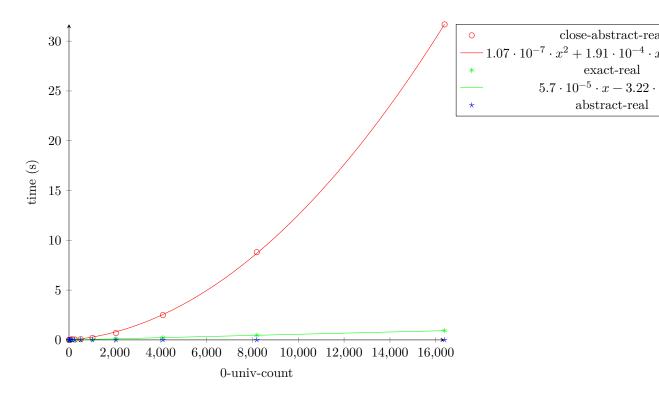
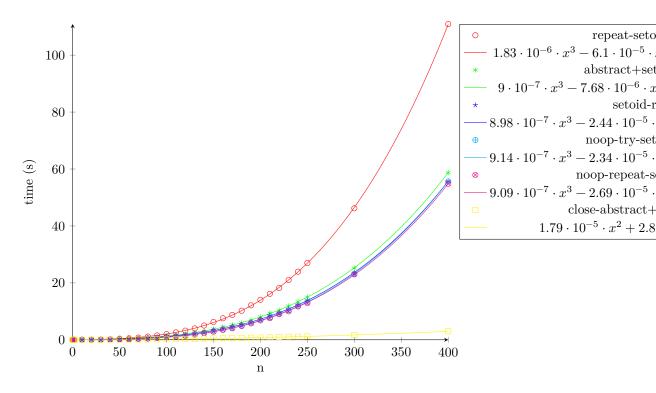
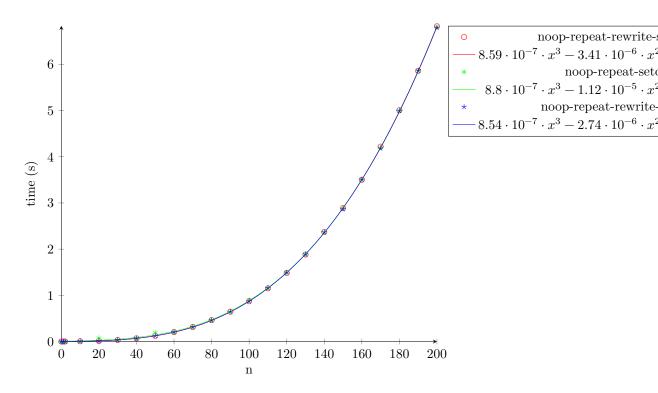


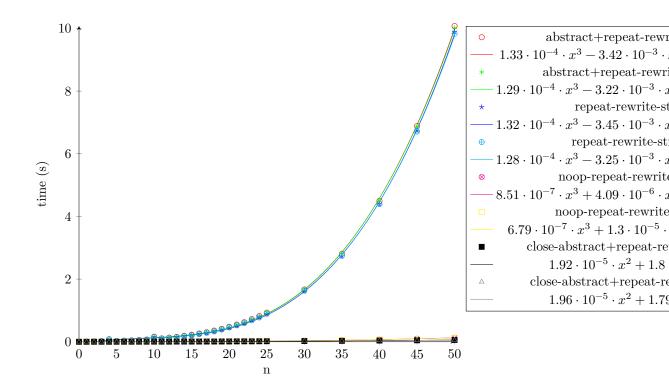
Figure 2: timing-n-polymorphic-universes param-1-n 0



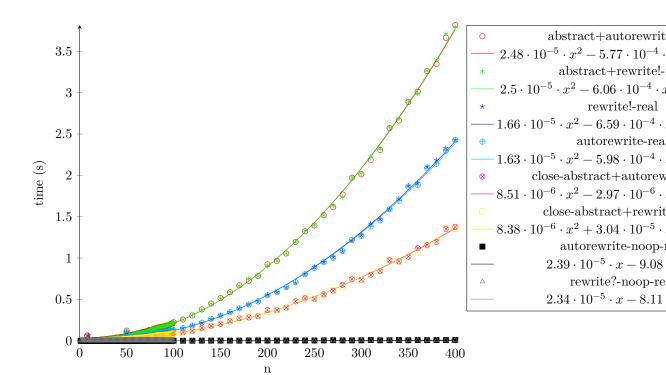
 $Figure \ 3: \ timing-repeat-setoid-rewrite-under-binders$



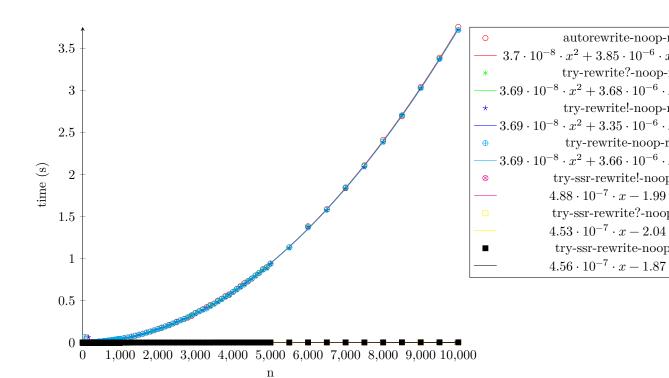
 $Figure\ 4:\ timing-repeat-setoid-rewrite-under-binders-noop$



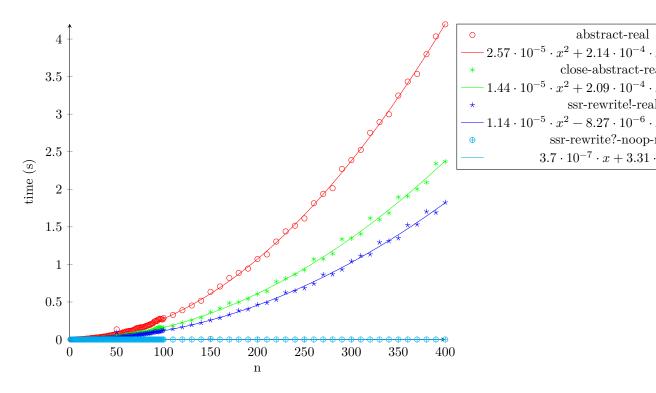
 $Figure\ 5:\ timing-rewrite-strat-under-binders$



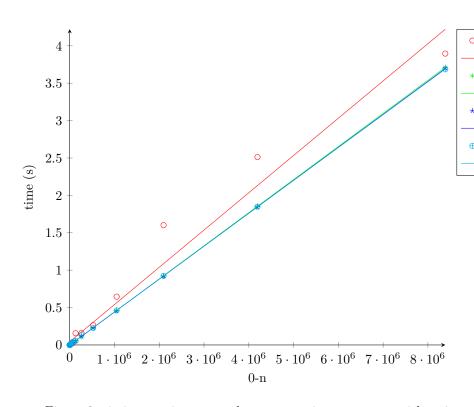
 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$



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



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



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

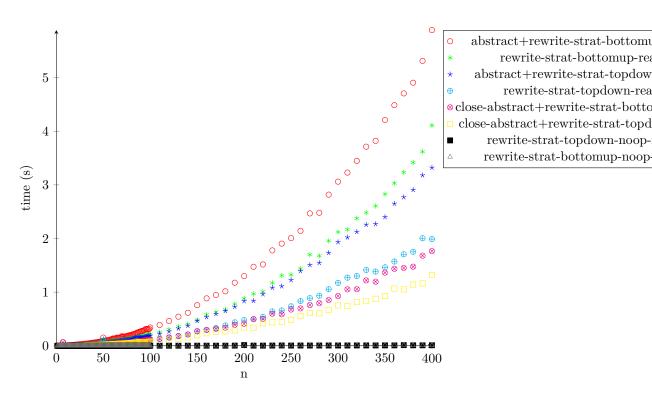
 $4.98 \cdot 10^{-7} \cdot x + 4.2 \cdot 10^{-2}$ try-ssr-rewrite?-noop-real

 $\begin{array}{l} 4.43 \cdot 10^{-7} \cdot x - 1.86 \cdot 10^{-3} \\ \text{try-ssr-rewrite-noop-real} \end{array}$

 $\begin{array}{l} 4.41 \cdot 10^{-7} \cdot x - 1.6 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.4\cdot 10^{-7}\cdot x + 1.7\cdot 10^{-3}$

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

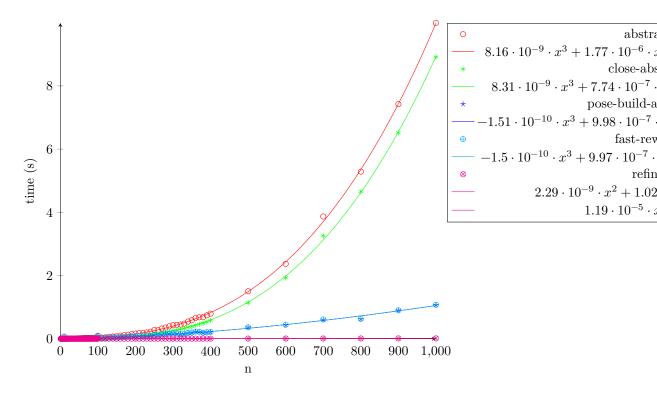


rewrite-strat-bottomup-rea abstract + rewrite - strat - topdow

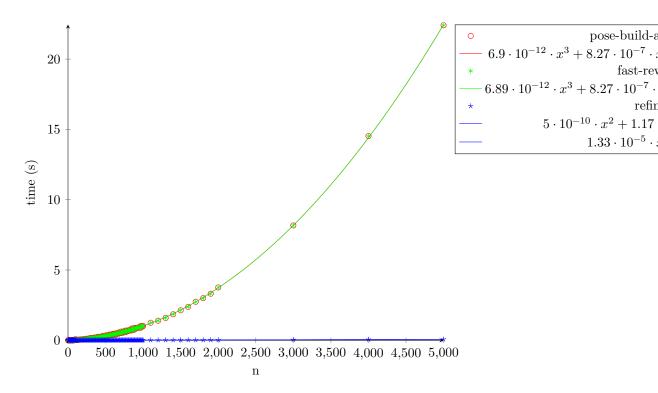
rewrite-strat-topdown-rea

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

 $Figure\ 10:\ timing-rewrite-repeated-app-rewrite-strat$



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



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

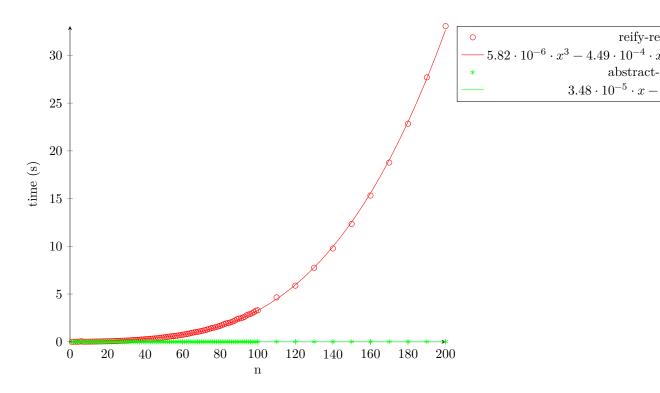
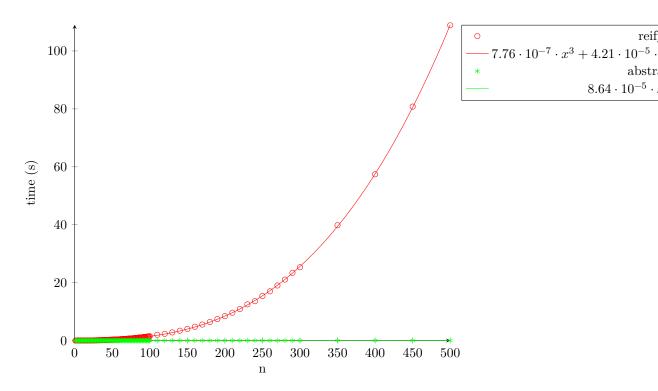
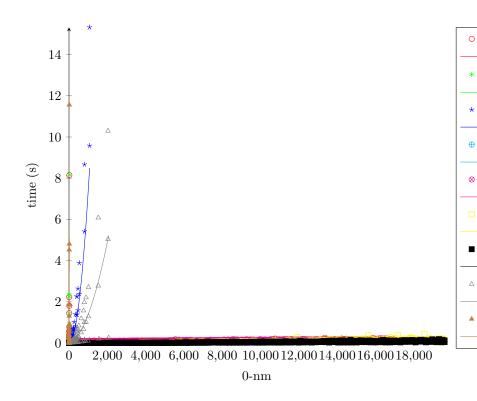


Figure 13: timing-typeclass-reification-let-in-HOAS



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



rewrite-strat (bottomup-bot 5.19 \cdot 10⁻³ exp (0.46 \cdot (rewrite-strat (topdown-bot 5.44 \cdot 10⁻³ exp (0.46 \cdot (

 $7.47 \cdot 10^{-6} \cdot x^2 - 1.57 \cdot 10^{-4} \cdot .$

 $7.97 \cdot 10^{-11} \cdot x^2 + 5.57 \cdot 10^{-6} \cdot$

 $2.15\cdot 10^{-11}\cdot x^2 + 6.04\cdot 10^{-6}\cdot$

 $2.14\cdot 10^{-10}\cdot x^2 + 4.59\cdot 10^{-6}\cdot \\$

 $1.04 \cdot 10^{-10} \cdot x^2 + 3.46 \cdot 10^{-6} \cdot \\$

 $1.05 \cdot 10^{-6} \cdot x^2 + 3.59 \cdot 10^{-4} \cdot x^2$

 $-6.72 \cdot 10^{-3} \cdot x^3 + 0.21 \cdot x^2 -$

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

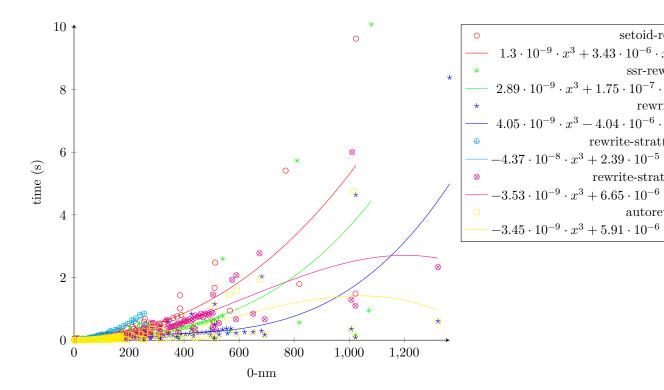
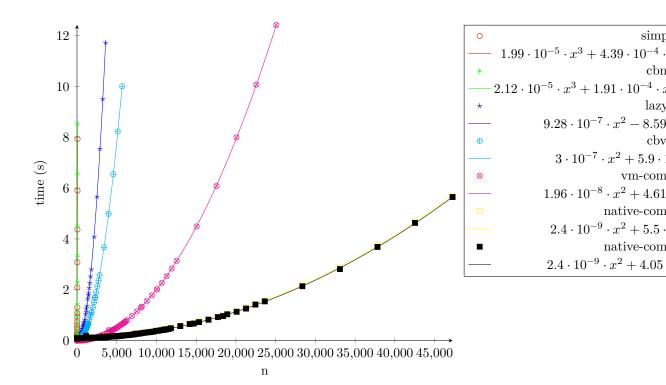


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



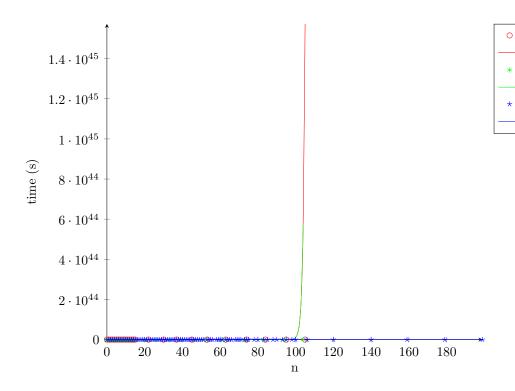
simp

vm-com

native-com

native-com

Figure 17: timing-sieve-of-eratosthenes



rewrite

rewrite-

 $-1.51 \cdot 10^{-6} \cdot x^3 + 2.15 \cdot 1$

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