

Figure 1: timing-pattern

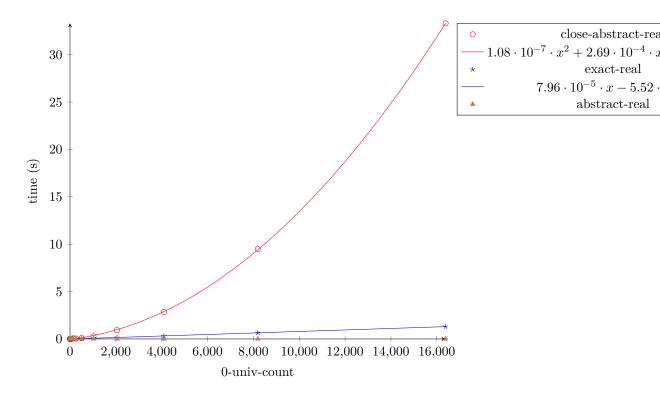
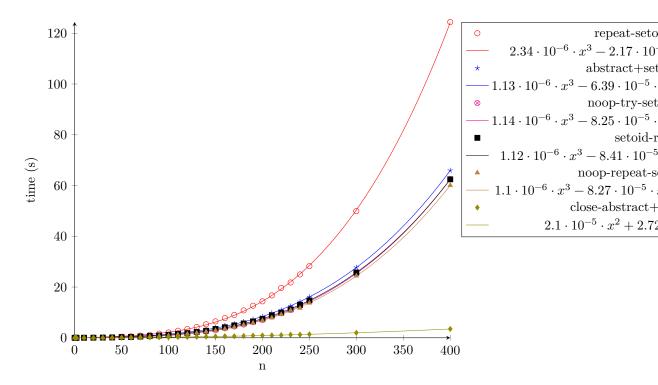
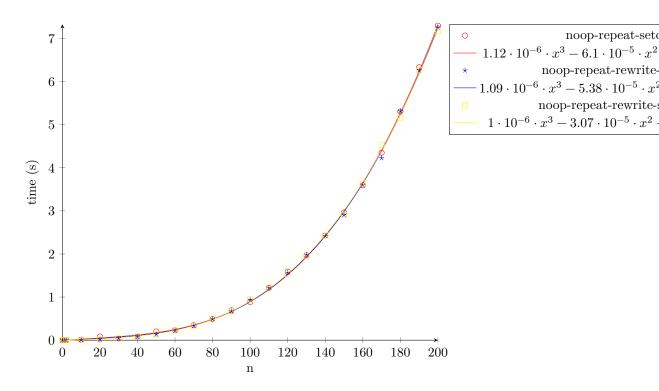


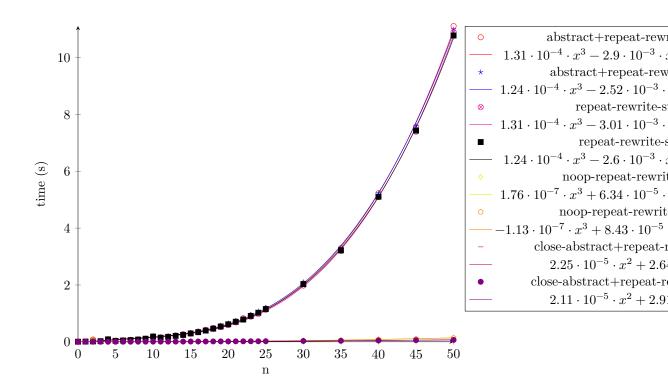
Figure 2: timing-n-polymorphic-universes param-1-n 0



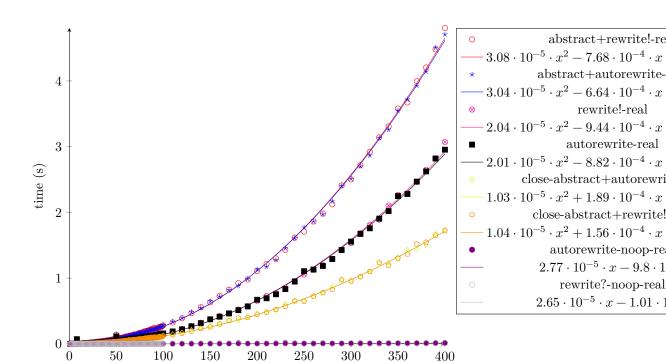
 $Figure \ 3: \ timing-repeat-setoid-rewrite-under-binders$



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

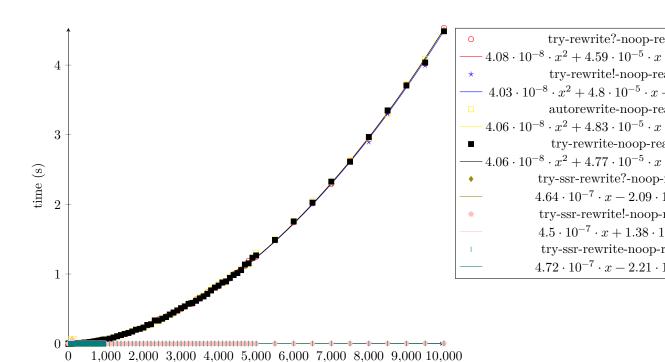


 $Figure\ 5:\ timing-rewrite-strat-under-binders$

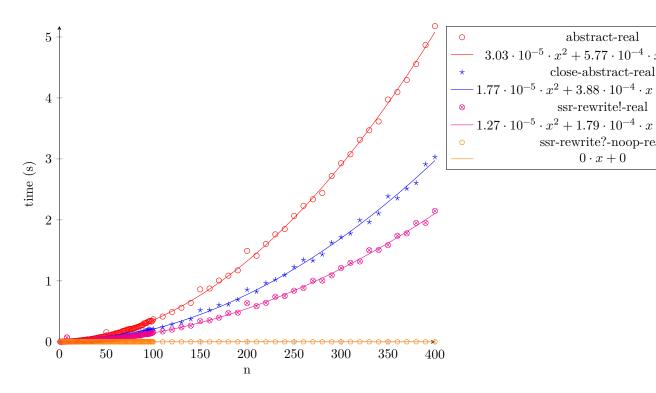


 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$

n



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



 ${\bf Figure~8:~timing\text{-}rewrite\text{-}repeated\text{-}app\text{-}ssrrewrite}$

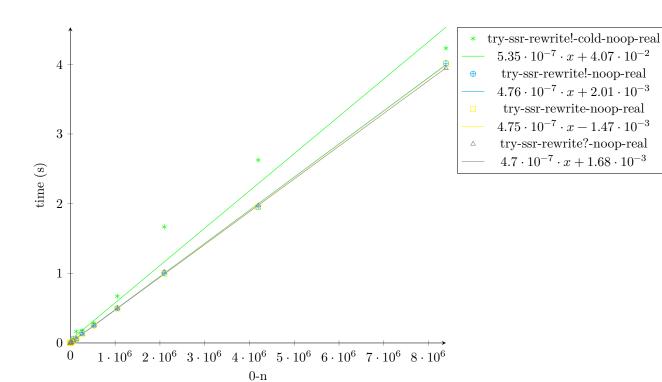
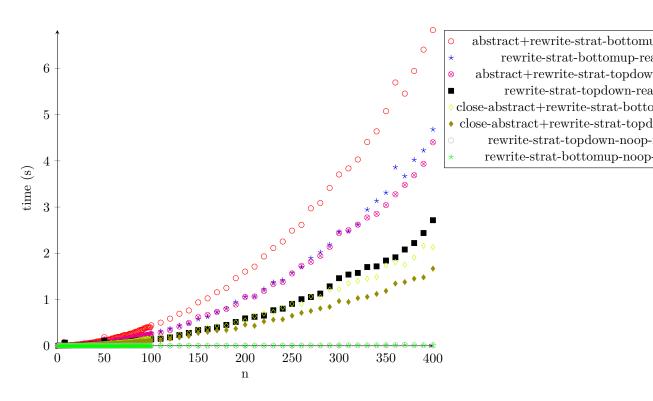


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$

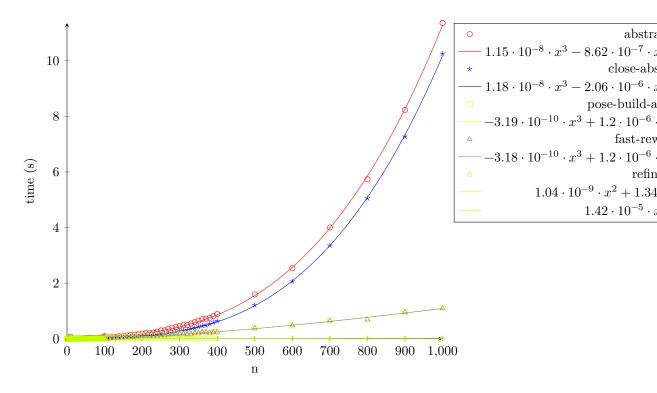


rewrite-strat-bottomup-rea

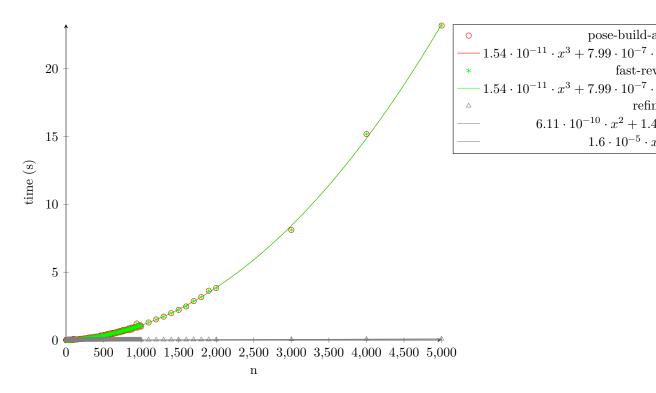
rewrite-strat-topdown-rea

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-rewrite-repeated-app-fast-rewrite-no-abstract

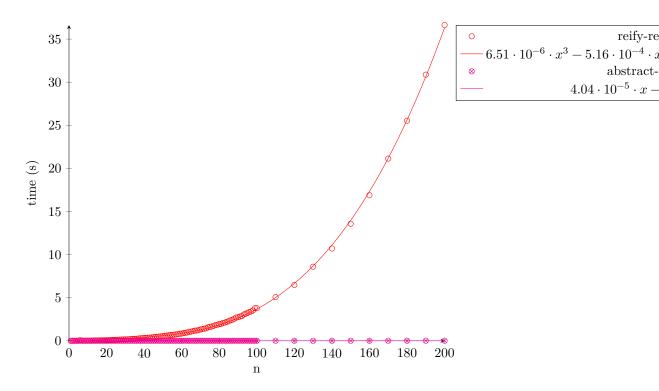
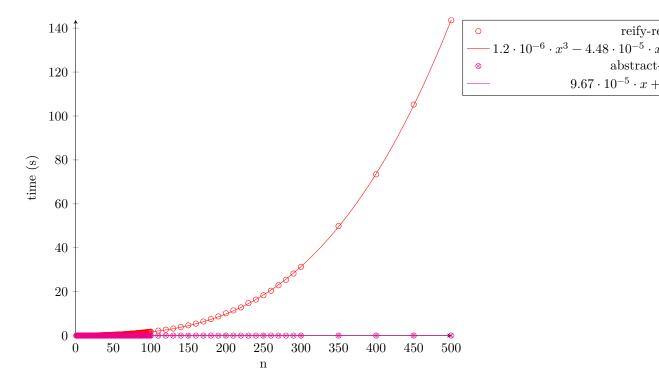
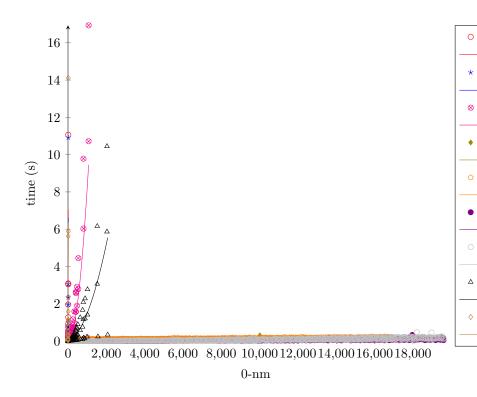


Figure 13: timing-typeclass-reification-let-in-HOAS



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



rewrite-strat(topdown-bot

 $8.15 \cdot 10^{-6} \cdot x^2 - 1.54 \cdot 10^{-6} \cdot x^2 = 1.54 \cdot 10^{-6} \cdot x^2$

 $1.33 \cdot 10^{-10} \cdot x^2 + 5.51 \cdot 10^{-6} \cdot$

 $7.01 \cdot 10^{-11} \cdot x^2 + 6.28 \cdot 10^{-6} \cdot$

 $1.1 \cdot 10^{-10} \cdot x^2 + 3.87 \cdot 10^{-6} \cdot x^2$

 $2.51\cdot 10^{-10}\cdot x^2 + 4.67\cdot 10^{-6}\cdot \\$

 $1.11 \cdot 10^{-6} \cdot x^2 + 3.91 \cdot 10^{-4} \cdot$

 $-8.26 \cdot 10^{-3} \cdot x^3 + 0.26 \cdot x^2 - \\$

 $7.75 \cdot 10^{-3} \exp{(0.45 \cdot ($ rewrite-strat(bottomup-bot

 $7.28 \cdot 10^{-3} exp (0.45 \cdot ($

cps+cbn-real

cps+cbv-real

cps+lazy-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

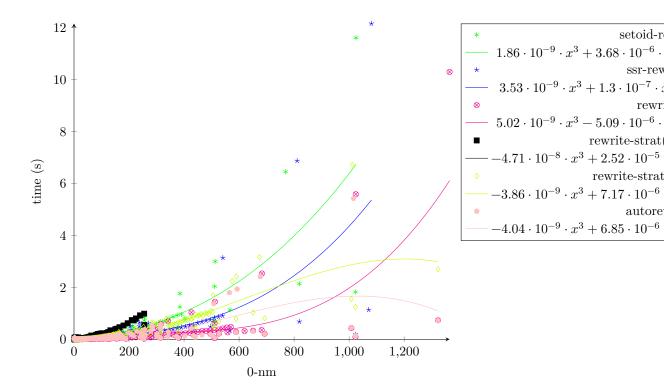
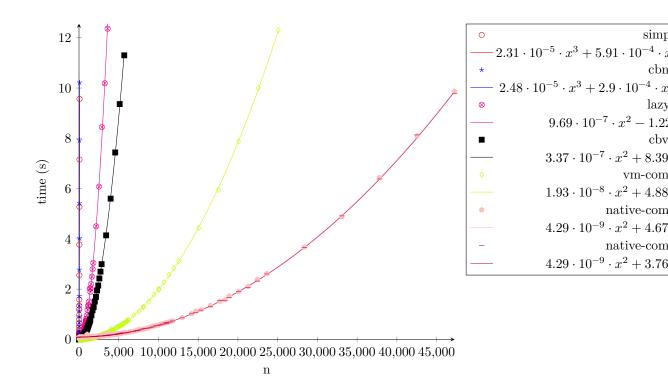


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

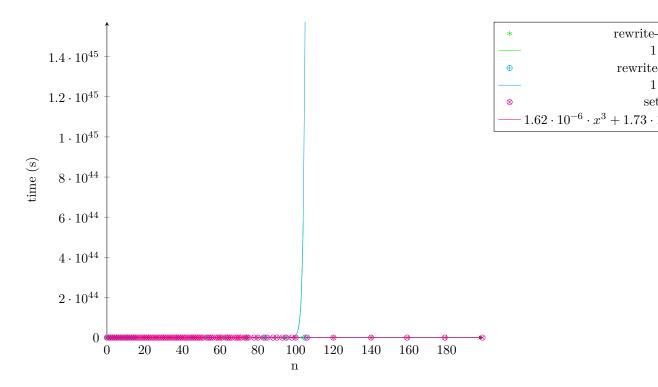
lazy

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 $Figure\ 17:\ timing\mbox{-sieve-of-eratos} thenes$



rewrite-

rewrite

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