

Figure 1: timing-pattern

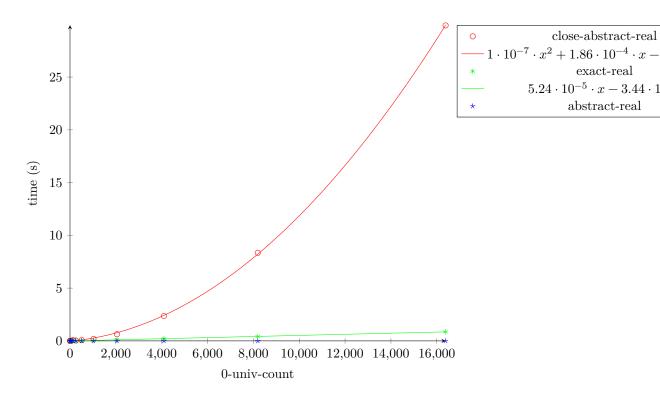
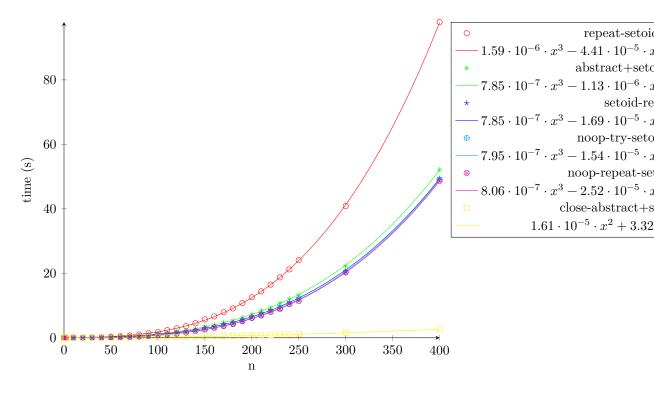
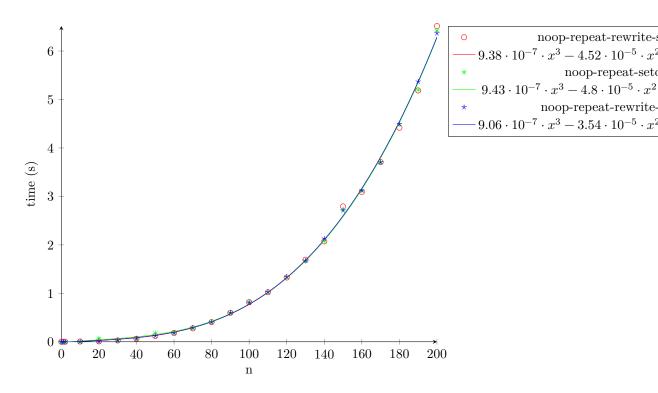


Figure 2: timing-n-polymorphic-universes param-1-n 0



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



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

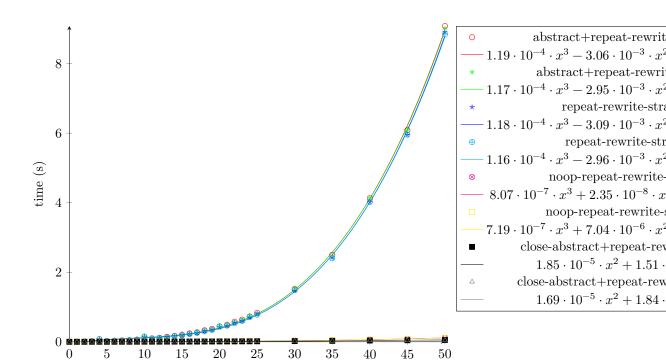


Figure 5: timing-rewrite-strat-under-binders

n

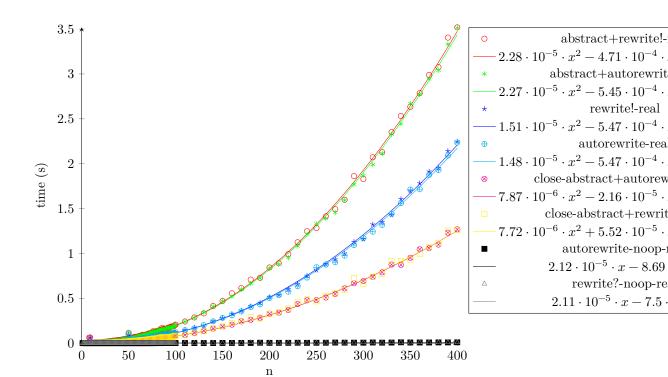


Figure 6: timing-rewrite-repeated-app-autorewrite

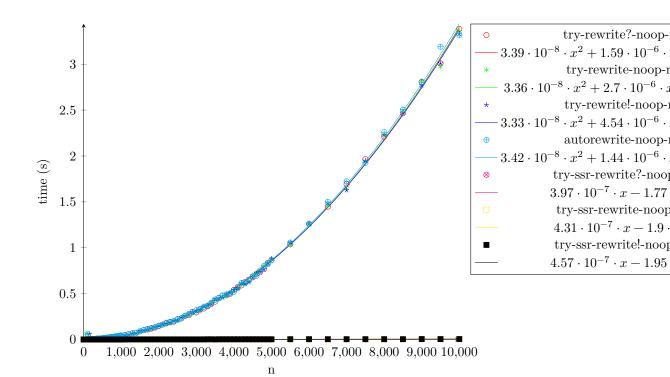
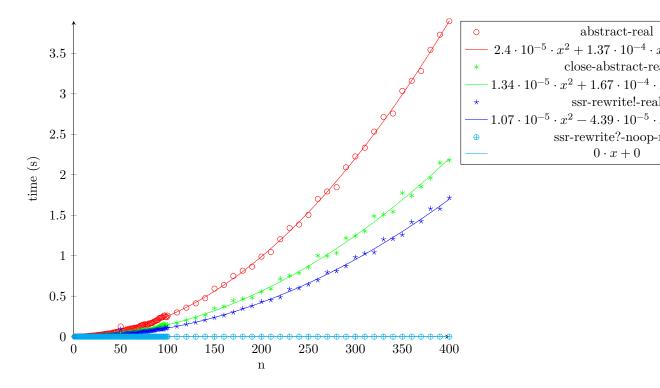
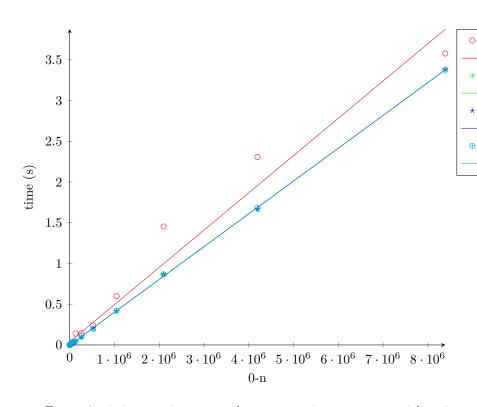


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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



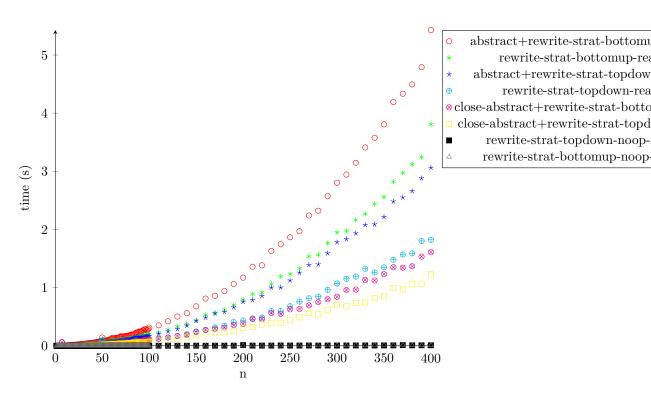
try-ssr-rewrite!-cold-noop-rea $4.58 \cdot 10^{-7} \cdot x + 3.77 \cdot 10^{-2}$

try-ssr-rewrite-noop-real $4.03\cdot 10^{-7}\cdot x - 2.3\cdot 10^{-3}$

try-ssr-rewrite?-noop-real $4.03\cdot 10^{-7}\cdot x - 1.53\cdot 10^{-3}$

try-ssr-rewrite!-noop-real $4.03\cdot 10^{-7}\cdot x + 7.55\cdot 10^{-4}$

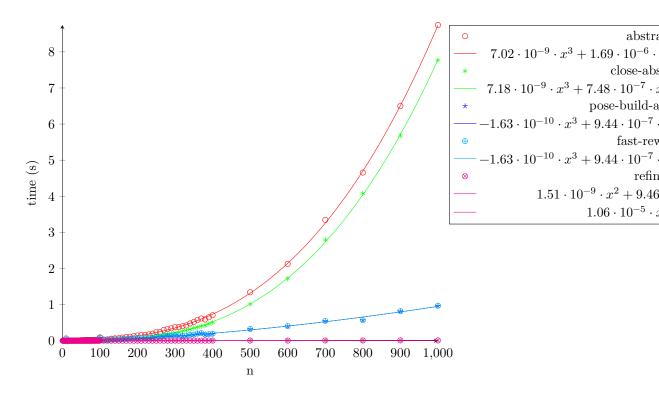
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



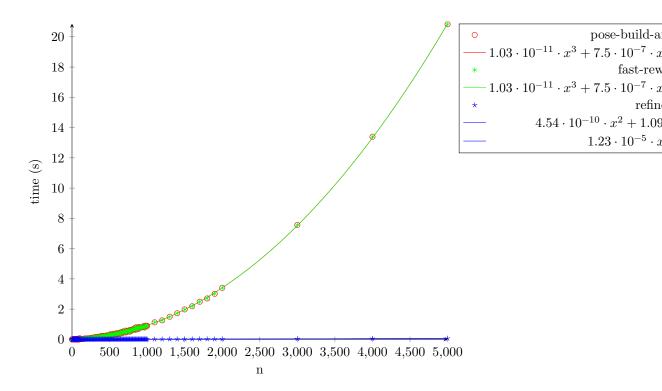
rewrite-strat-bottomup-rea abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

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

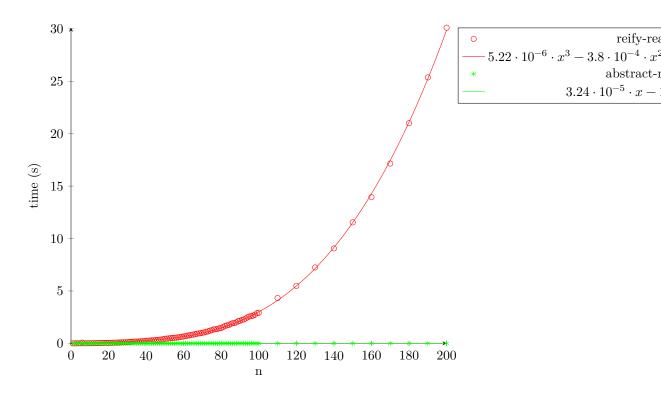
 $Figure~10:~timing\mbox{-rewrite-repeated-app-rewrite-strat}$



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



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



 $Figure \ 13: \ timing-type class-reification-let-in-HOAS$

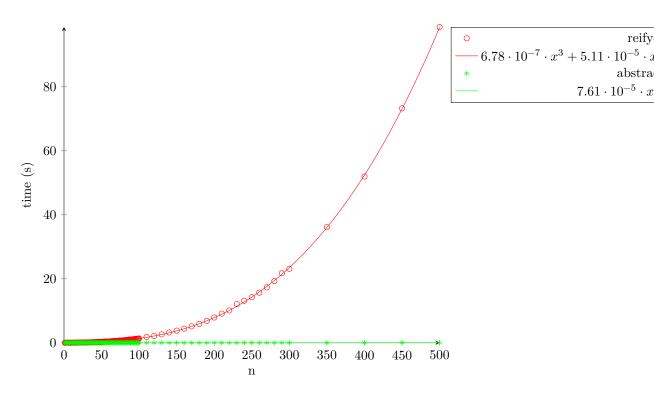


Figure 14: timing-typeclass-reification-let-in-PHOAS

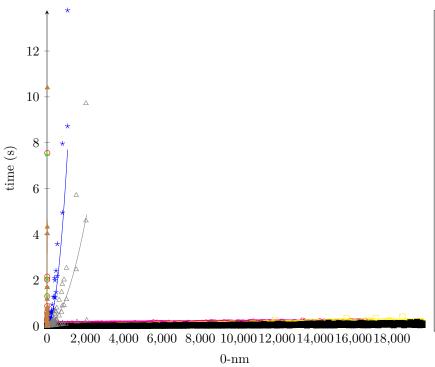


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(topdown-bot) $2.08 \cdot 10^{-3} exp(0.51 \cdot ($

rewrite-strat(bottomup-bot

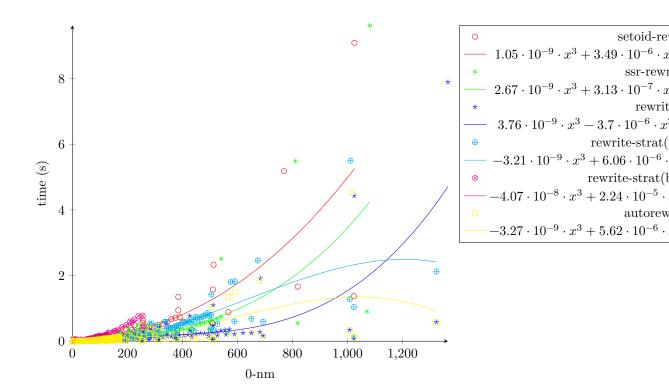
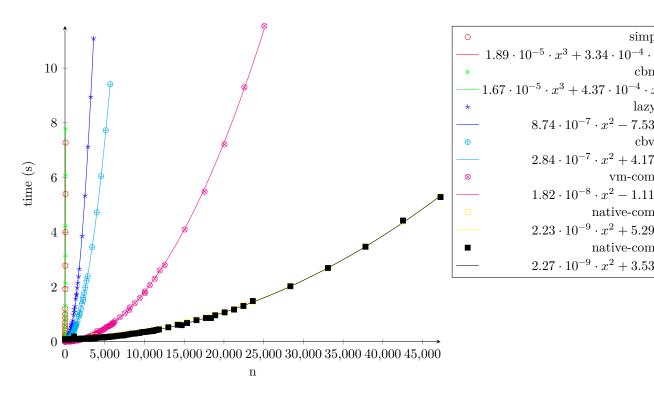


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $8.74 \cdot 10^{-7} \cdot x^2 - 7.53$

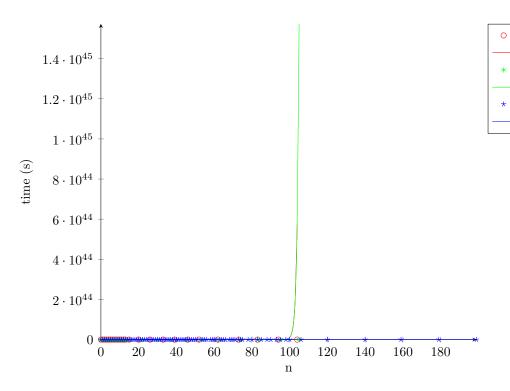
 $2.84 \cdot 10^{-7} \cdot x^2 + 4.17$

 $1.82 \cdot 10^{-8} \cdot x^2 - 1.11$

 $2.23 \cdot 10^{-9} \cdot x^2 + 5.29$

 $2.27 \cdot 10^{-9} \cdot x^2 + 3.53$

Figure 17: timing-sieve-of-eratosthenes



rewrite

rewrite

 $-1.32 \cdot 10^{-6} \cdot x^3 + 2.88 \cdot 1$

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