

Figure 1: timing-pattern

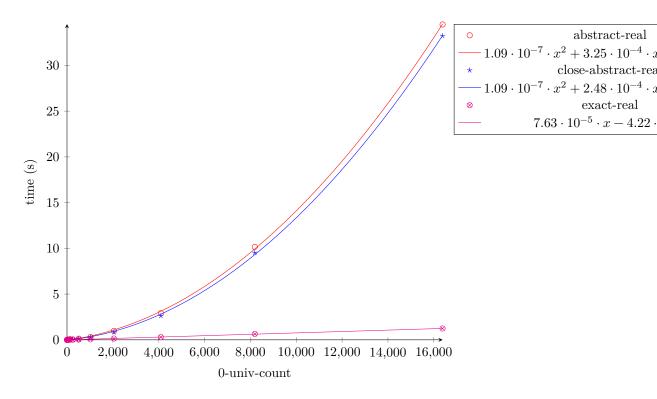
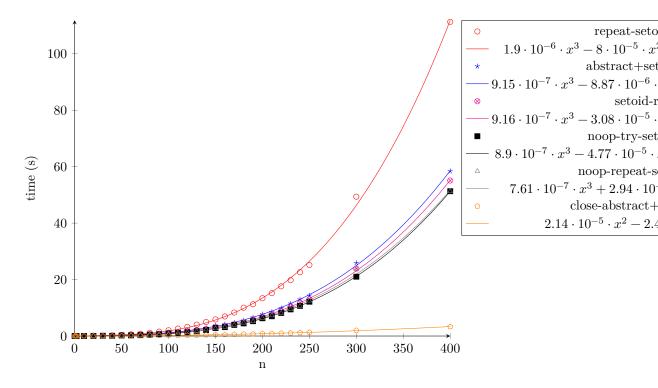
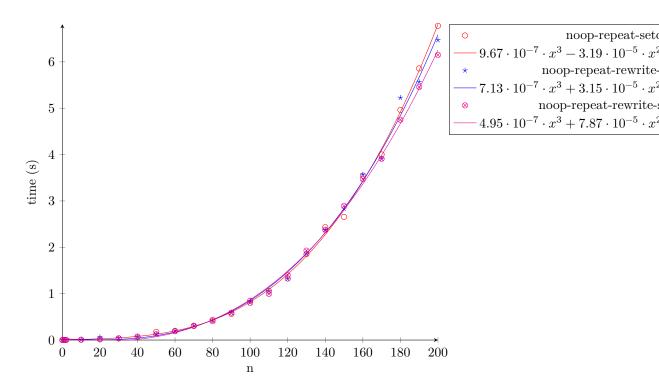


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$



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



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

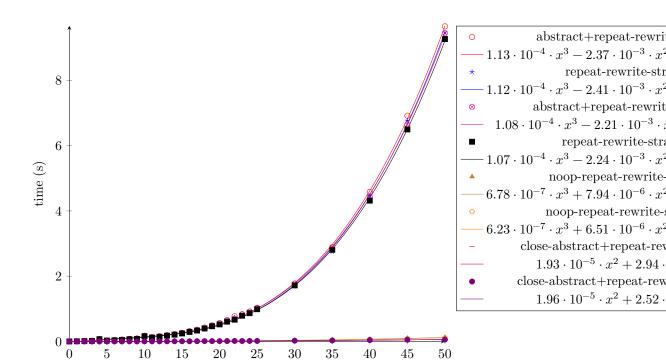
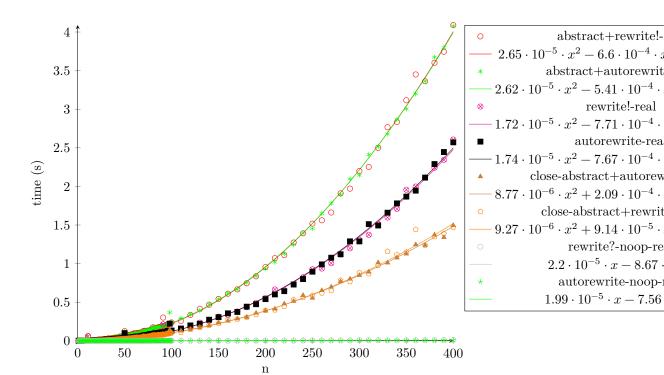


Figure 5: timing-rewrite-strat-under-binders

n



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

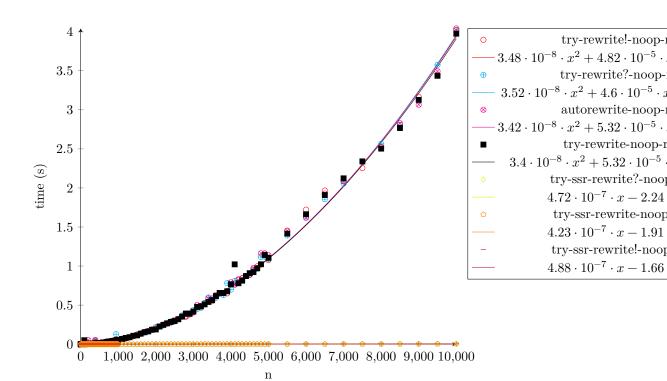
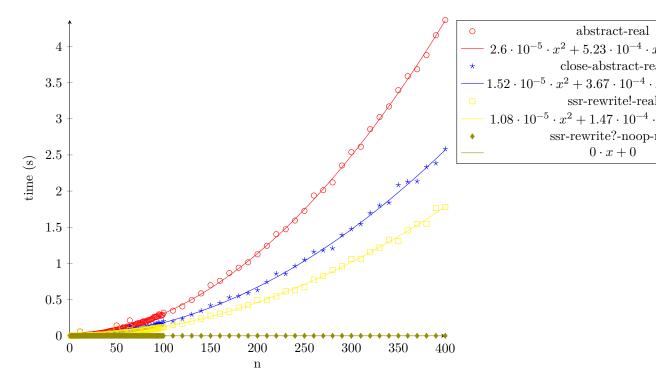
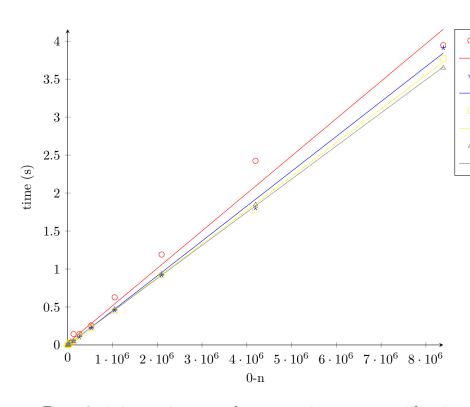


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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



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

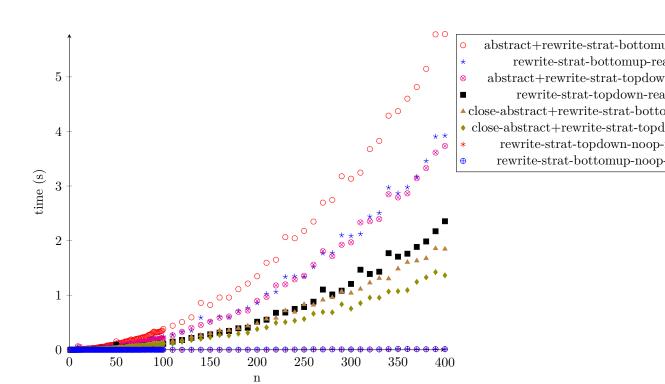
 $4.93 \cdot 10^{-7} \cdot x + 2.35 \cdot 10^{-2}$ try-ssr-rewrite-noop-real

 $\begin{array}{l} 4.59 \cdot 10^{-7} \cdot x - 8.52 \cdot 10^{-3} \\ \text{try-ssr-rewrite?-noop-real} \end{array}$

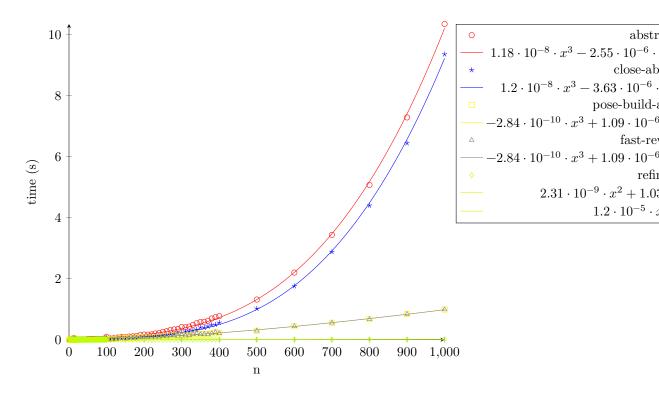
 $\begin{array}{l} 4.45 \cdot 10^{-7} \cdot x - 4.66 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.36\cdot 10^{-7}\cdot x + 2.74\cdot 10^{-3}$

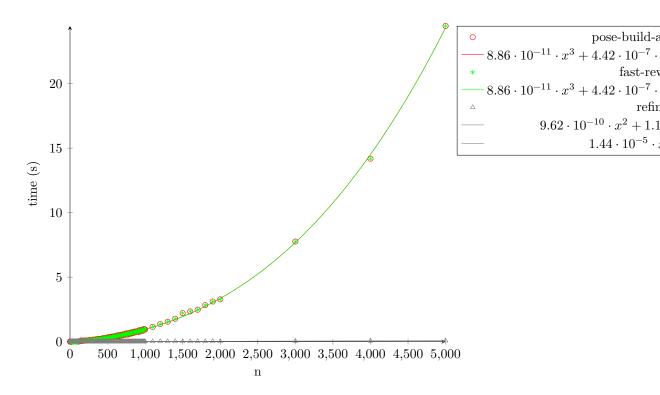
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



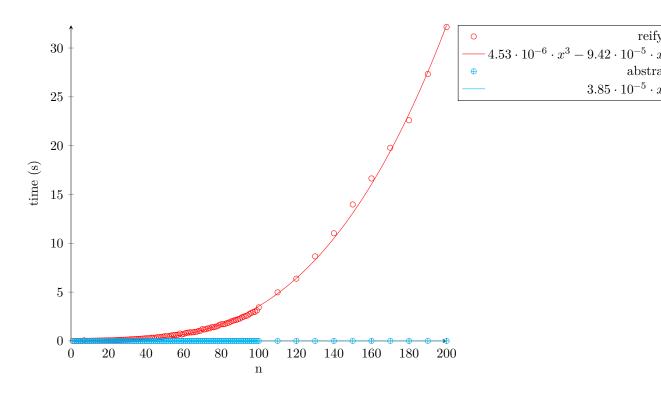
 $Figure~10:~timing\mbox{-rewrite-repeated-app-rewrite-strat}$



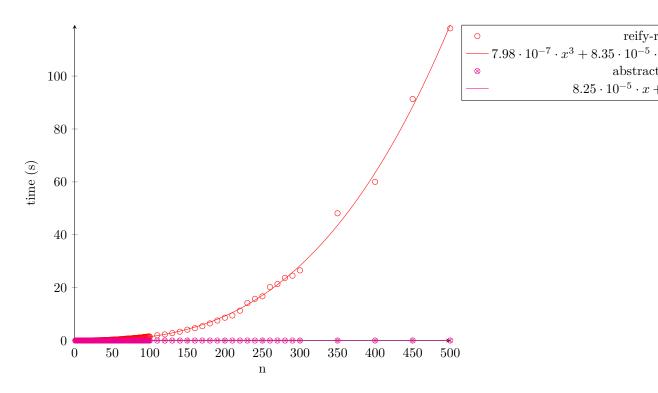
 $Figure~11:~timing\mbox{-rewrite-repeated-app-fast-rewrite}$



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



 ${\bf Figure~13:~timing-type class-reification-let-in-HOAS}$



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

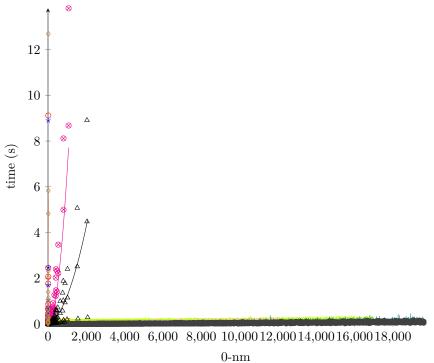


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(bottomup-bot $6.36 \cdot 10^{-3} \exp{(0.45 \cdot ($

rewrite-strat (topdown-bot) $4.63\cdot 10^{-3} \exp{(0.47\cdot ($

 $6.63 \cdot 10^{-6} \cdot x^2 + 2.61 \cdot 10^{-5} \cdot x^2 + 2.61 \cdot 10^{-5}$

 $1.8 \cdot 10^{-10} \cdot x^2 + 3.74 \cdot 10^{-6} \cdot x^2$

 $1.21 \cdot 10^{-10} \cdot x^2 + 6.29 \cdot 10^{-6} \cdot$

 $2.29 \cdot 10^{-10} \cdot x^2 + 3.6 \cdot 10^{-6} \cdot x^2$

cps+cbn-real

cps+native-compute

cps+vm-compute-

cps+lazy-real

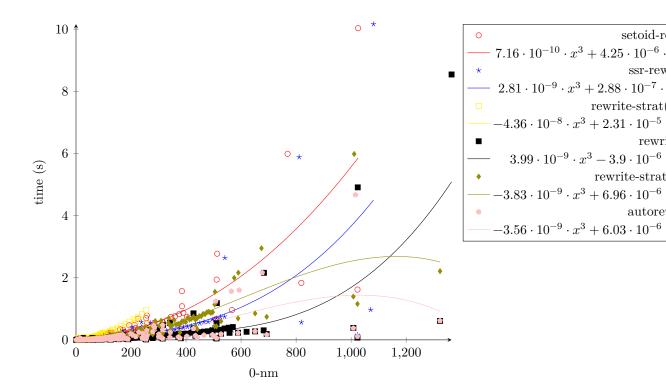
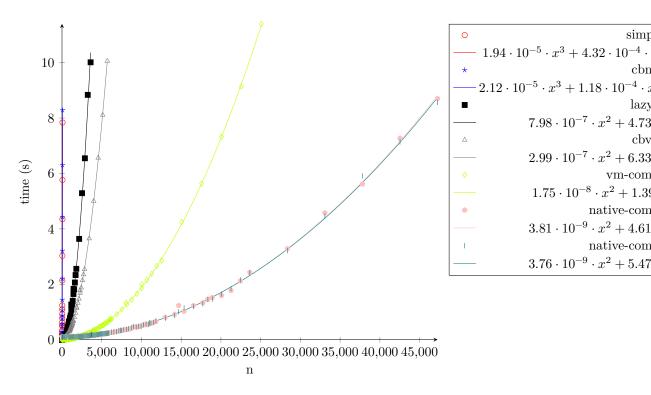


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $7.98 \cdot 10^{-7} \cdot x^2 + 4.73$

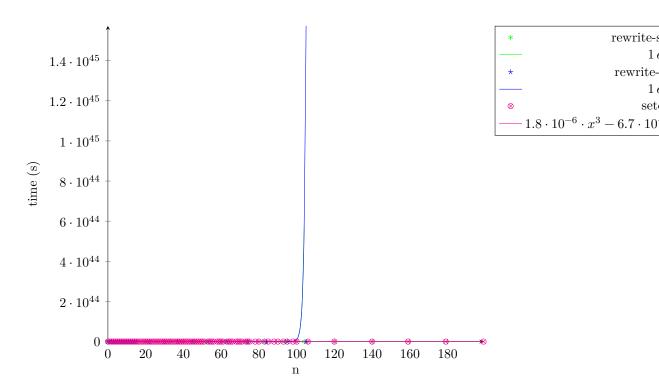
 $2.99 \cdot 10^{-7} \cdot x^2 + 6.33$

 $1.75 \cdot 10^{-8} \cdot x^2 + 1.39$

 $3.81 \cdot 10^{-9} \cdot x^2 + 4.61$

 $3.76 \cdot 10^{-9} \cdot x^2 + 5.47$

Figure 17: timing-sieve-of-eratosthenes



rewrite-

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

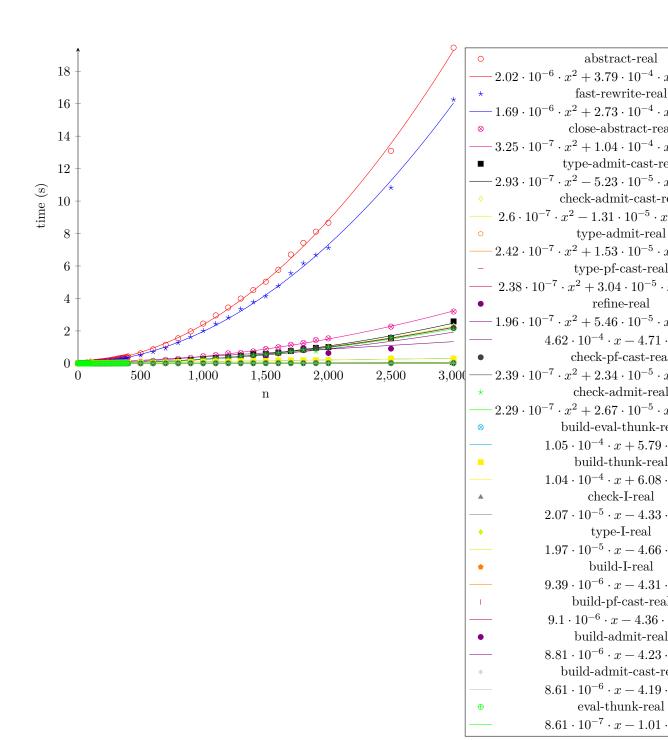


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2