

Figure 1: timing-pattern

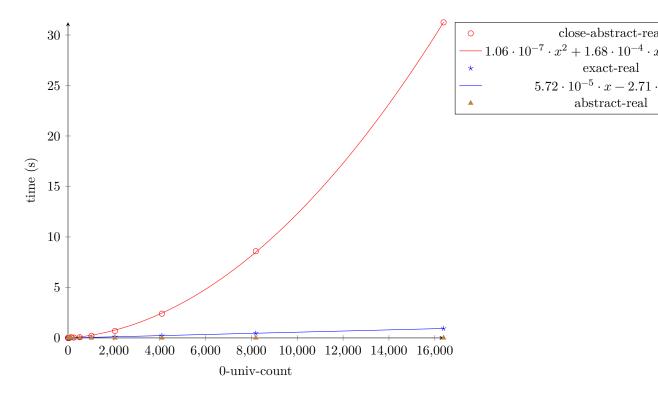
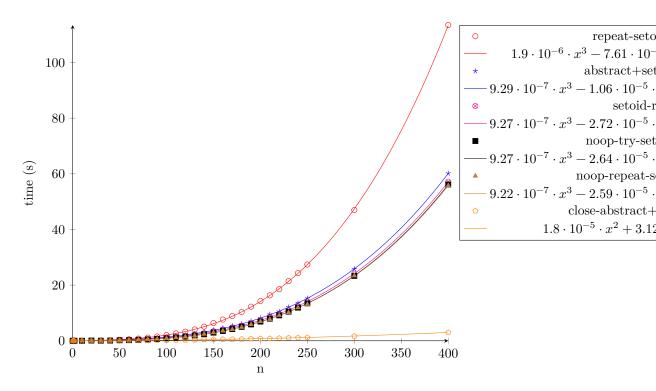


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

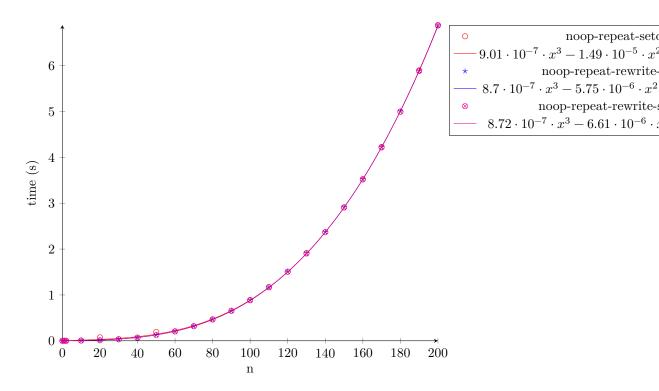
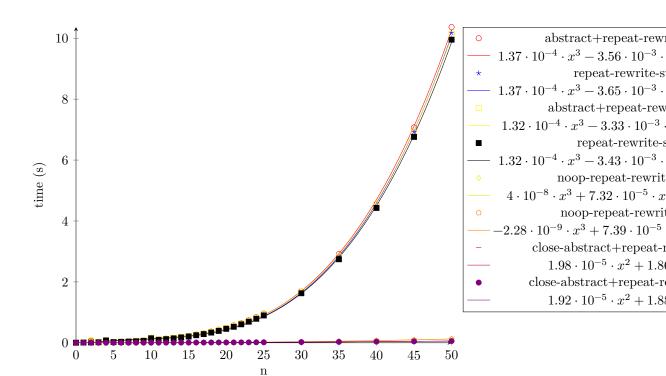
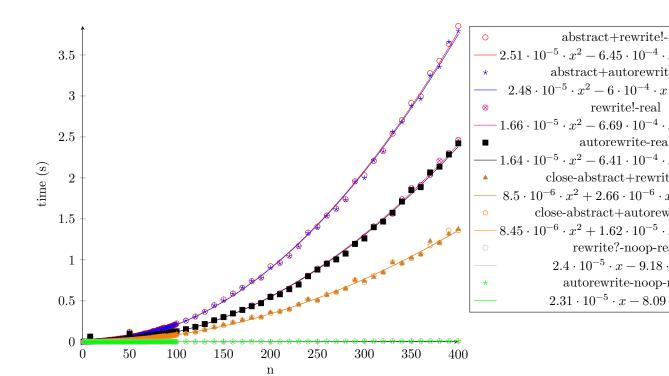


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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



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

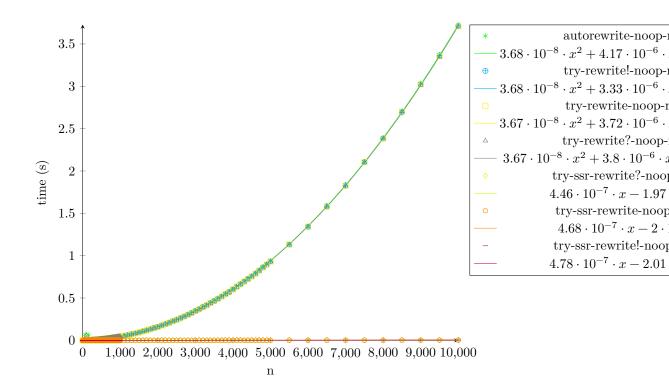
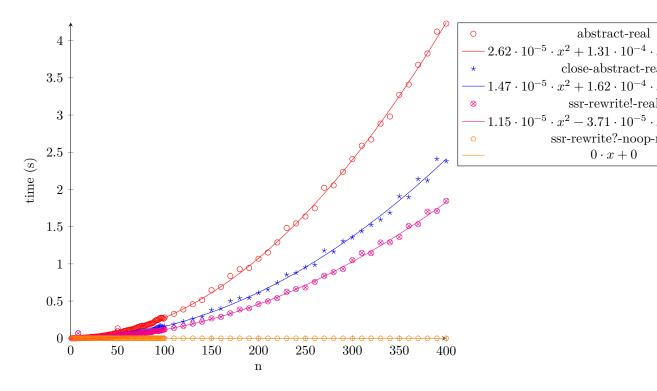
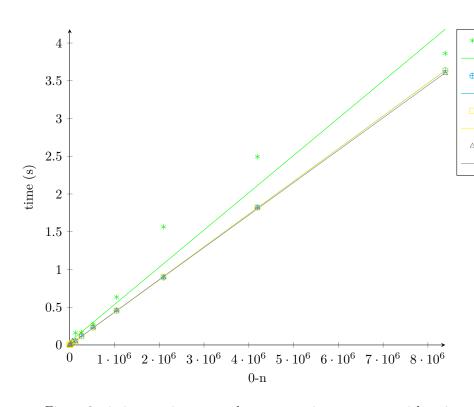


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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



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

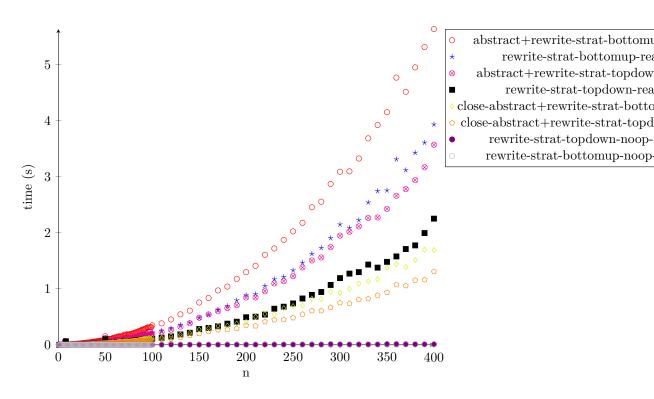
 $\begin{array}{l} 4.94\cdot 10^{-7}\cdot x + 4.23\cdot 10^{-2}\\ \text{try-ssr-rewrite?-noop-real} \end{array}$

 $\begin{array}{l} 4.34\cdot 10^{-7}\cdot x - 7.2\cdot 10^{-4}\\ \text{try-ssr-rewrite-noop-real} \end{array}$

 $\begin{array}{l} 4.33\cdot 10^{-7}\cdot x + 5.36\cdot 10^{-5}\\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.29\cdot 10^{-7}\cdot x + 2.97\cdot 10^{-3}$

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

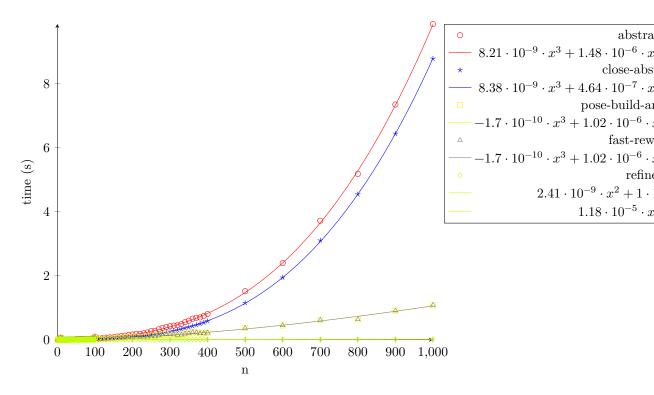


rewrite-strat-bottomup-rea

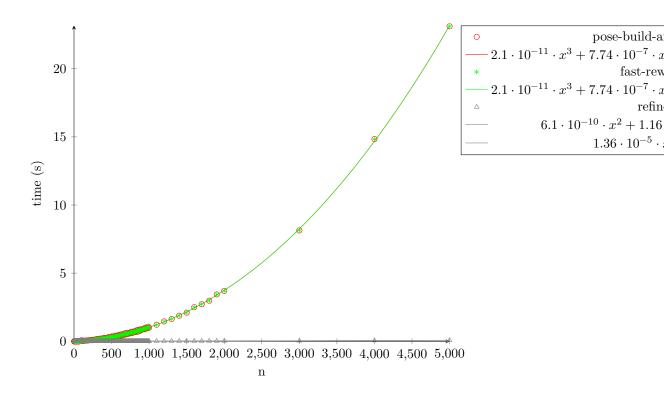
rewrite-strat-topdown-rea

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

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



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



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

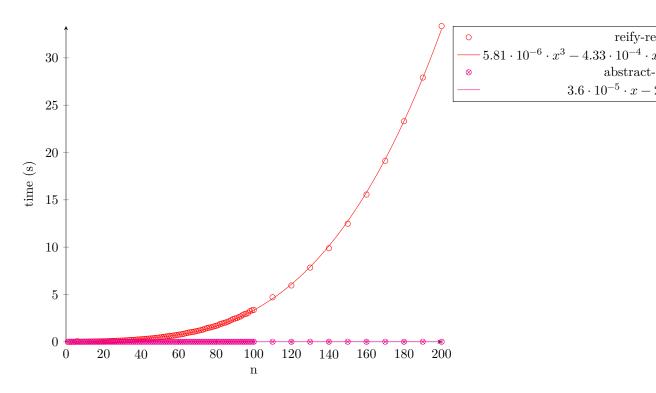


Figure 13: timing-typeclass-reification-let-in-HOAS

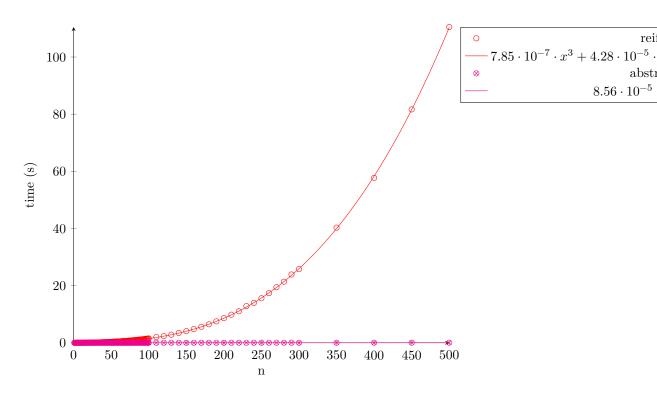


Figure 14: timing-typeclass-reification-let-in-PHOAS

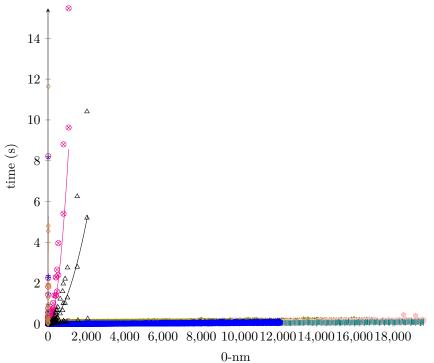


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(bottomup-bot $5.1 \cdot 10^{-3} exp(0.46 \cdot (0.46 \cdot$

rewrite-strat(topdown-bot) $5.48 \cdot 10^{-3} exp(0.46 \cdot ($

 $7.52 \cdot 10^{-6} \cdot x^2 - 1.52 \cdot 10^{-4} \cdot x^2 + 1.52 \cdot 10^{-4} \cdot x^2$

 $3.8 \cdot 10^{-11} \cdot x^2 + 5.85 \cdot 10^{-6} \cdot x^2$

 $2.08 \cdot 10^{-10} \cdot x^2 + 4.58 \cdot 10^{-6} \cdot$

 $9.16\cdot 10^{-11}\cdot x^2 + 3.73\cdot 10^{-6}\cdot \\$

 $-6.75 \cdot 10^{-3} \cdot x^3 + 0.22 \cdot x^2 -$

cps+cbn-real

cps+lazy-real

 $_{\rm cps+cbv\text{-}real}$

cps+vm-compute-

cps+native-compute

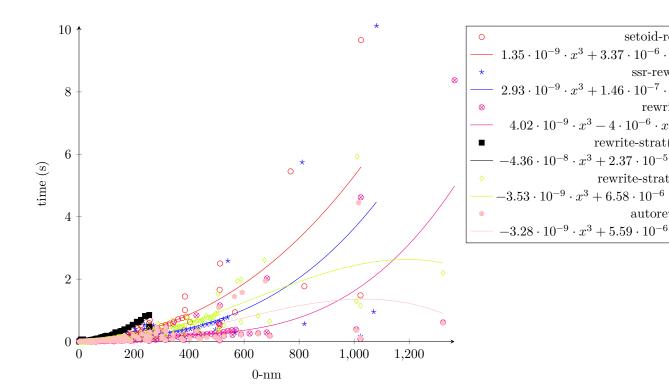
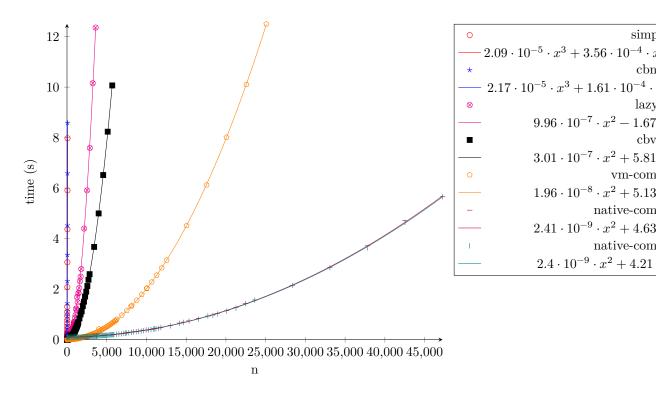


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-com

native-com

 $9.96 \cdot 10^{-7} \cdot x^2 - 1.67$

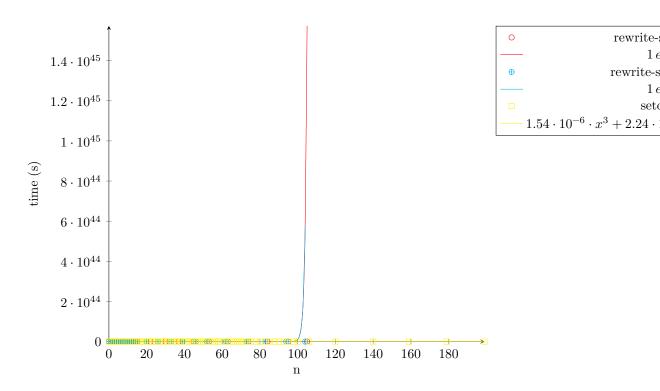
 $3.01 \cdot 10^{-7} \cdot x^2 + 5.81$

 $1.96 \cdot 10^{-8} \cdot x^2 + 5.13$

 $2.41 \cdot 10^{-9} \cdot x^2 + 4.63$

 $2.4 \cdot 10^{-9} \cdot x^2 + 4.21$

Figure 17: timing-sieve-of-eratosthenes



rewrite-

rewrite-s

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