

Figure 1: timing-pattern

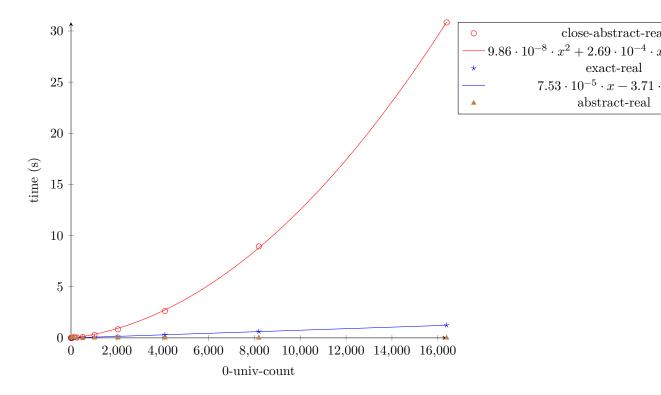
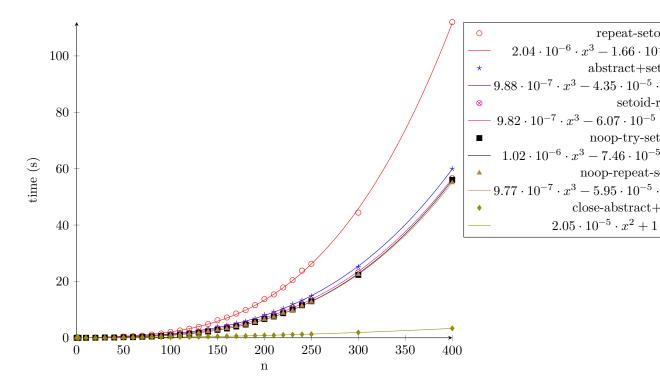
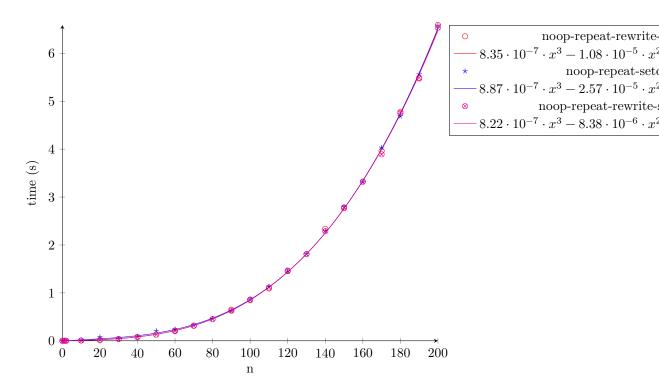


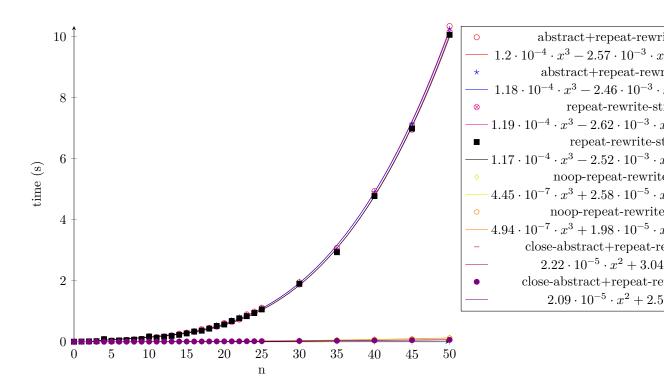
Figure 2: timing-n-polymorphic-universes param-1-n 0



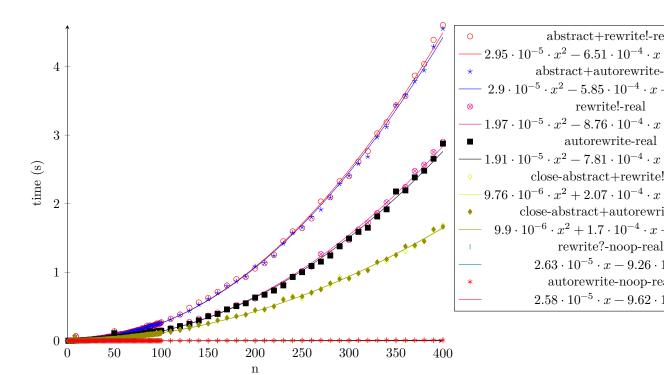
 $Figure \ 3: \ timing-repeat-setoid-rewrite-under-binders$



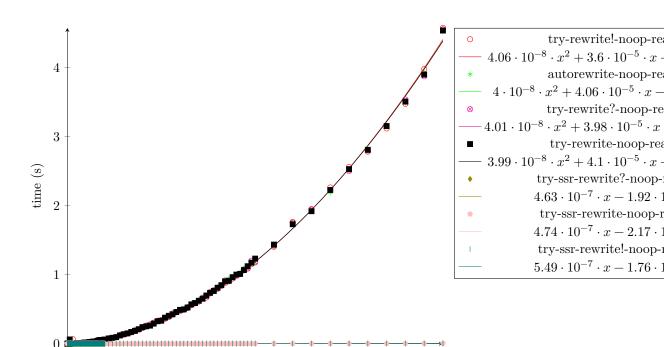
 $Figure\ 4:\ timing-repeat-setoid-rewrite-under-binders-noop$



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

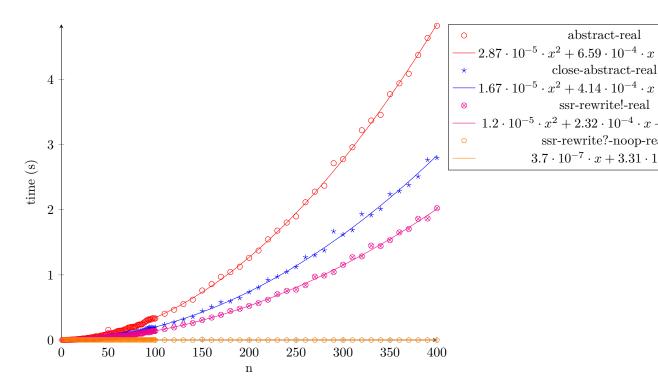


 $Figure \ 6: \ timing-rewrite-repeated-app-autorewrite \\$

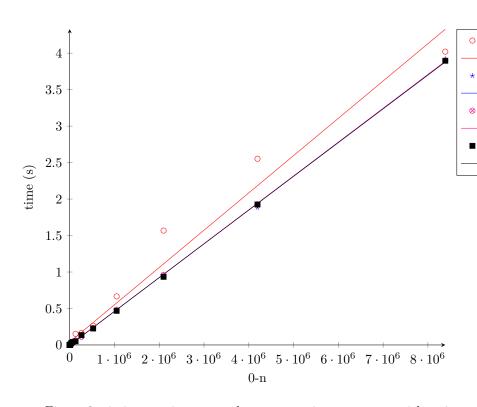


 $Figure~7:~timing\mbox{-rewrite-repeated-app-autorewrite-noop}$

1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000



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



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

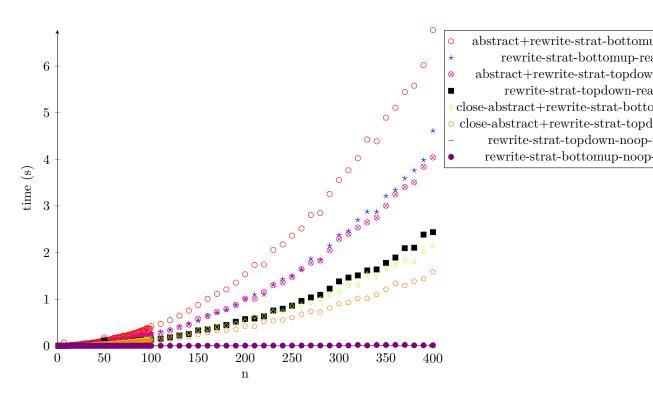
 $5.11 \cdot 10^{-7} \cdot x + 3.93 \cdot 10^{-2}$ try-ssr-rewrite-noop-real

 $4.64\cdot 10^{-7}\cdot x - 4.49\cdot 10^{-3}$ try-ssr-rewrite?-noop-real

 $\begin{array}{l} 4.64 \cdot 10^{-7} \cdot x - 2.41 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$

 $4.63\cdot 10^{-7}\cdot x - 2.27\cdot 10^{-3}$

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

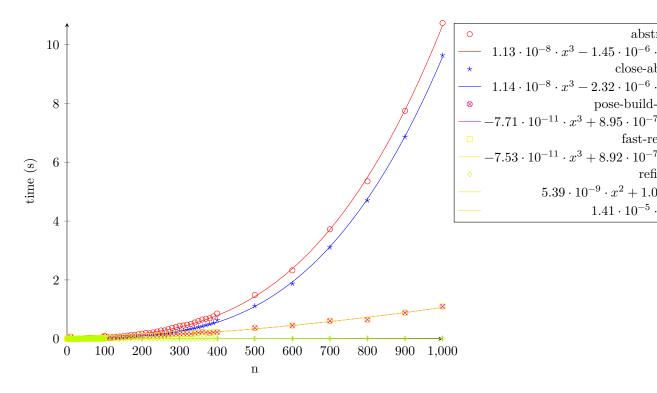


 $abstract + rewrite - strat - bottom \\ \\$ rewrite-strat-bottomup-rea

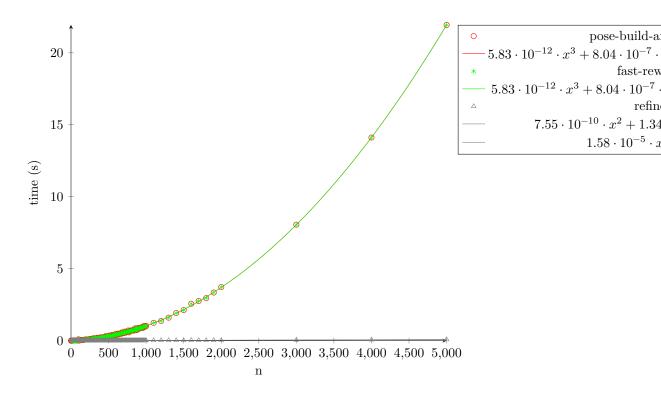
abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

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

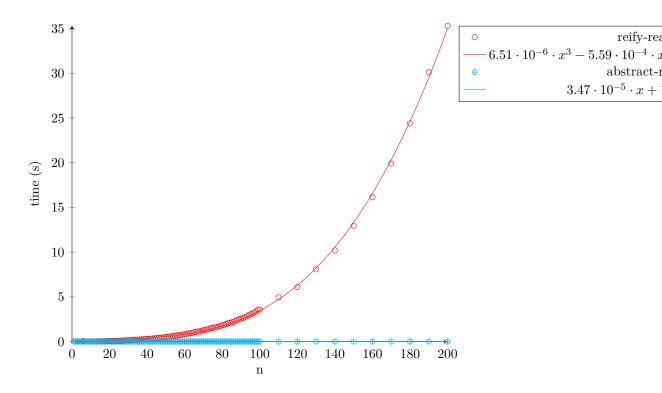
 $Figure\ 10:\ timing-rewrite-repeated-app-rewrite-strat$



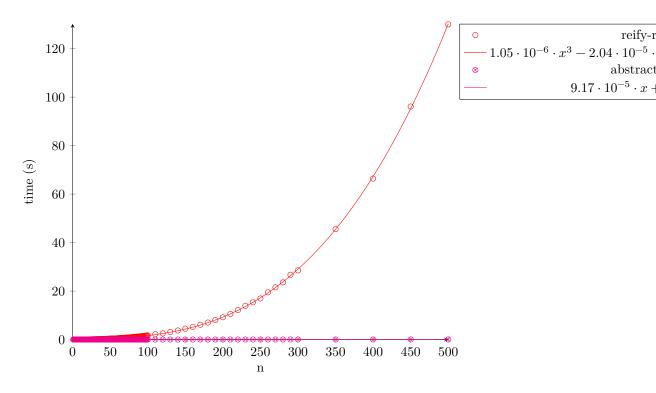
 $Figure~11:~timing\mbox{-rewrite-repeated-app-fast-rewrite}$



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



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



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

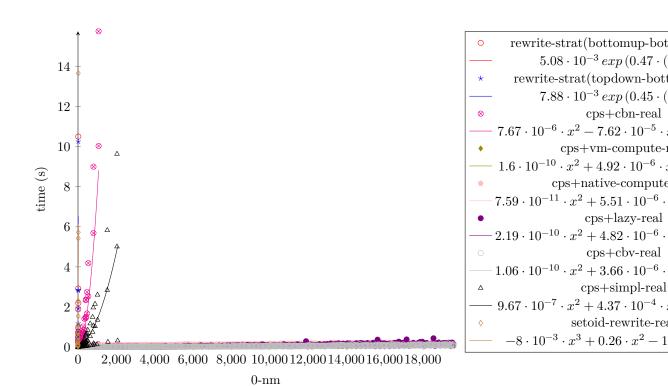


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

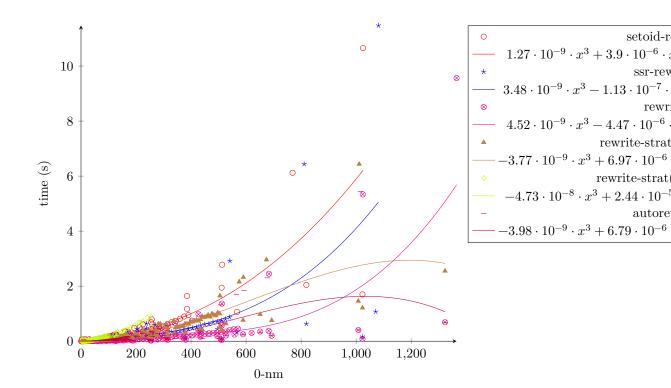
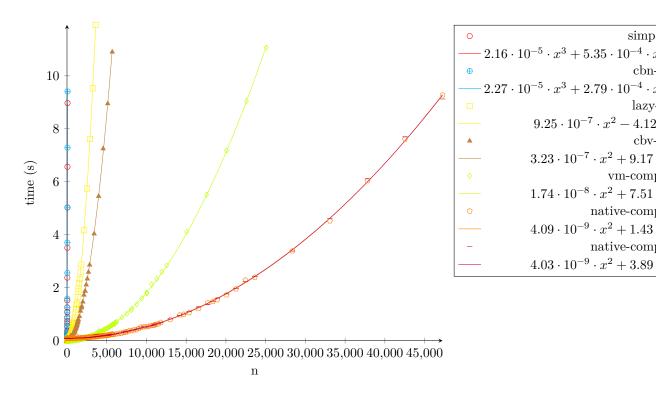


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

vm-com

native-comp

native-comp

 $9.25 \cdot 10^{-7} \cdot x^2 - 4.12$

 $3.23 \cdot 10^{-7} \cdot x^2 + 9.17$

 $1.74 \cdot 10^{-8} \cdot x^2 + 7.51$

 $4.09\cdot 10^{-9}\cdot x^2 + 1.43$

 $4.03 \cdot 10^{-9} \cdot x^2 + 3.89$

Figure 17: timing-sieve-of-eratosthenes

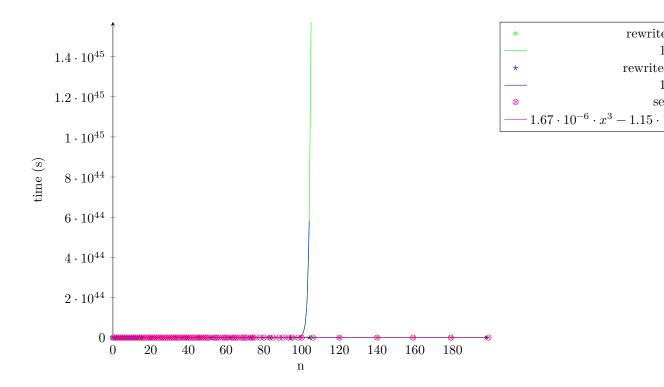


Figure 18: timing-rewrite-under-lets-plus-0 $\,$