

Figure 1: timing-pattern

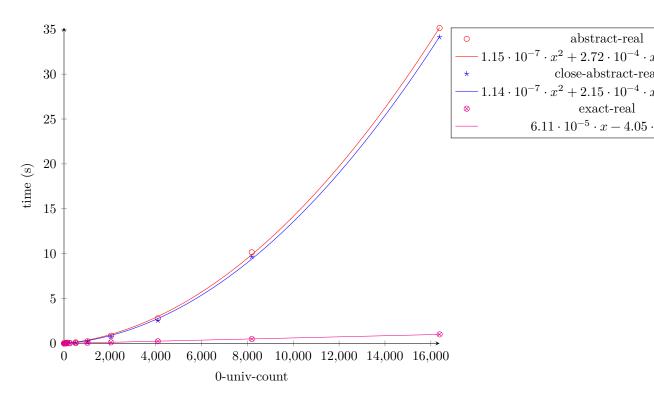


Figure 2: timing-n-polymorphic-universes param-1-n  $\,0\,$ 

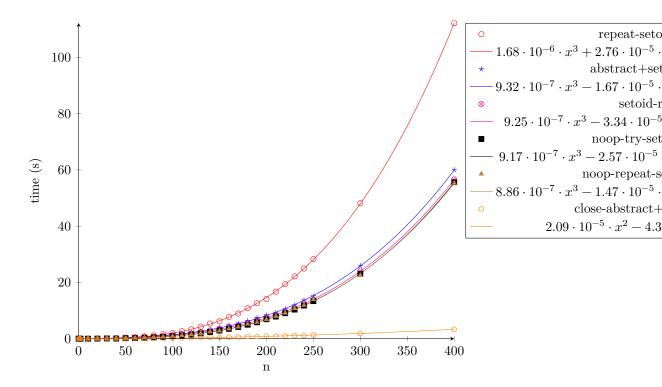


Figure 3: timing-repeat-setoid-rewrite-under-binders

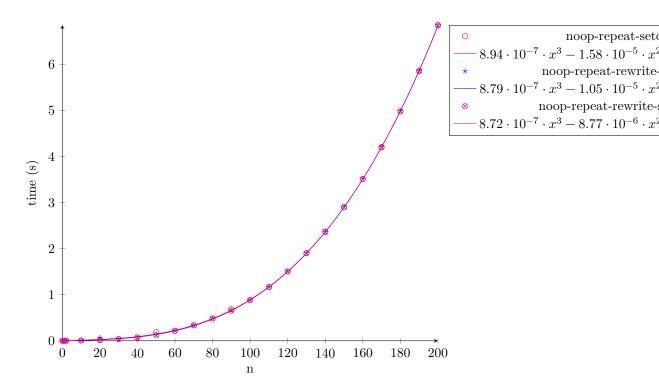
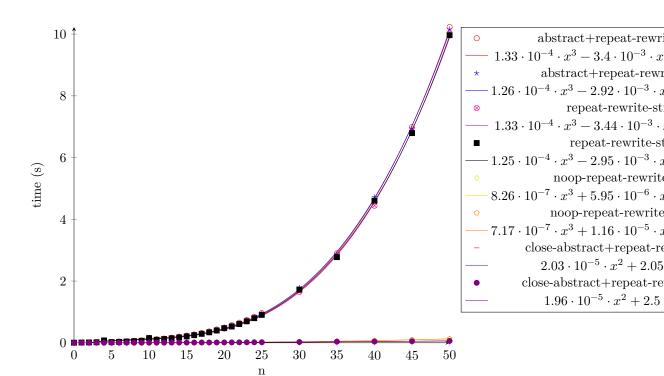


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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

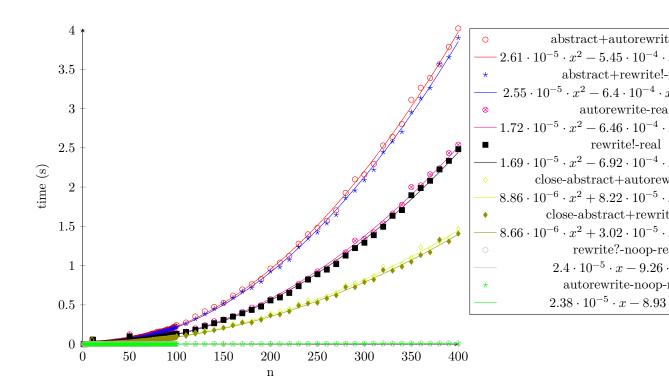


Figure 6: timing-rewrite-repeated-app-autorewrite

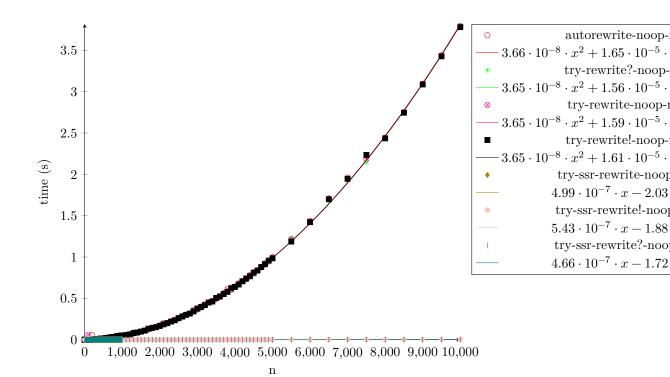


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

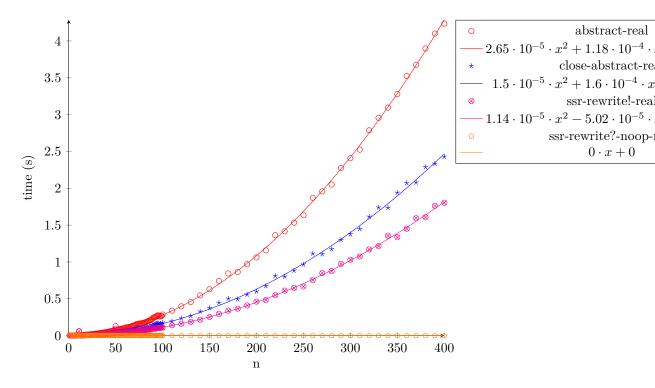
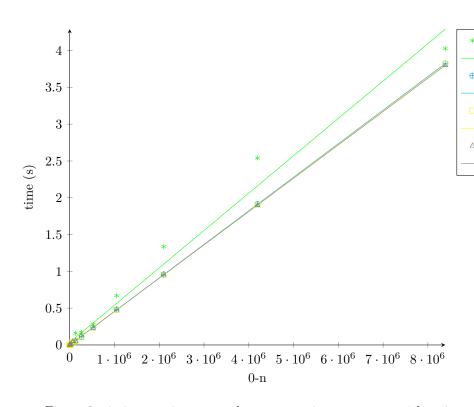


Figure 8: timing-rewrite-repeated-app-ssrrewrite



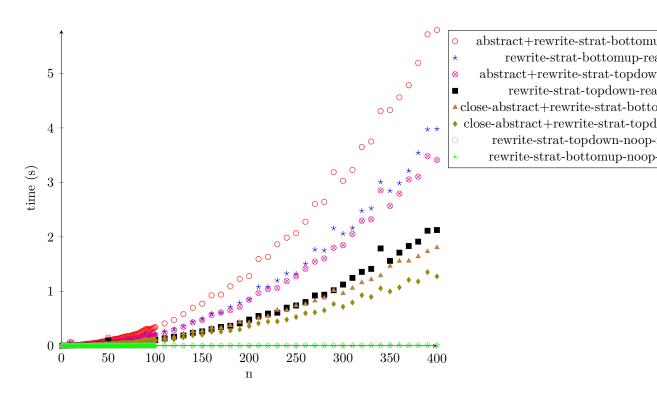
try-ssr-rewrite!-cold-noop-rea  $5.07 \cdot 10^{-7} \cdot x + 3.3 \cdot 10^{-2}$  try-ssr-rewrite-noop-real

 $\begin{array}{c} 4.56\cdot 10^{-7}\cdot x - 1.2\overset{\frown}{1}\cdot 10^{-3} \\ \text{try-ssr-rewrite?-noop-real} \end{array}$ 

 $\begin{array}{l} 4.55 \cdot 10^{-7} \cdot x - 1.38 \cdot 10^{-3} \\ \text{try-ssr-rewrite!-noop-real} \end{array}$ 

 $4.53\cdot 10^{-7}\cdot x + 1.75\cdot 10^{-3}$ 

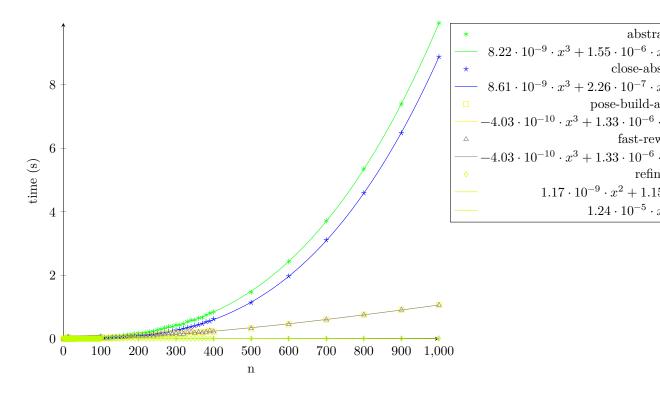
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn  $\ 1$ 



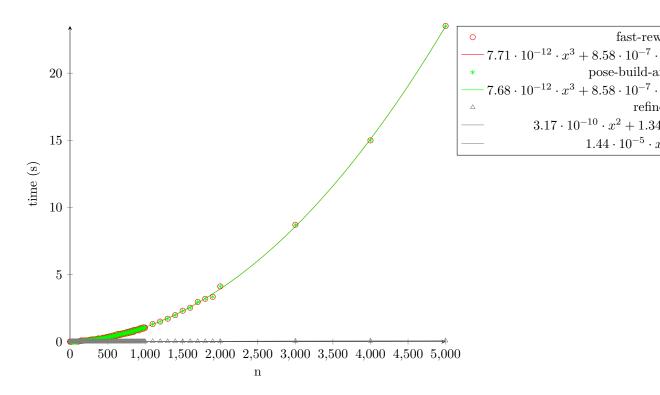
rewrite-strat-bottomup-rea

rewrite-strat-topdown-rea

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



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



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

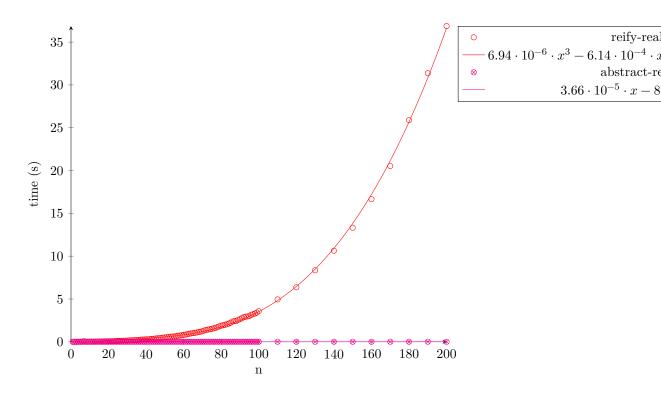
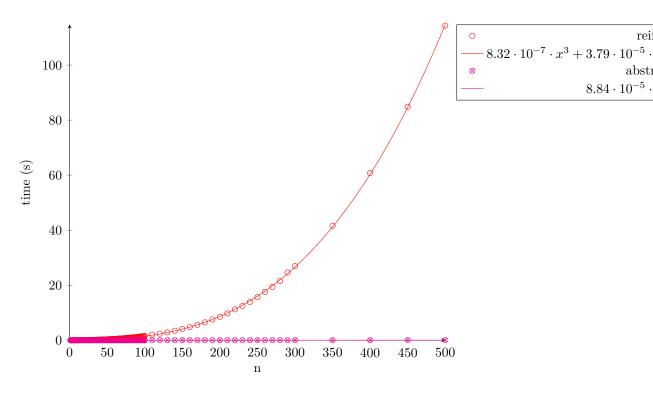


Figure 13: timing-typeclass-reification-let-in-HOAS



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

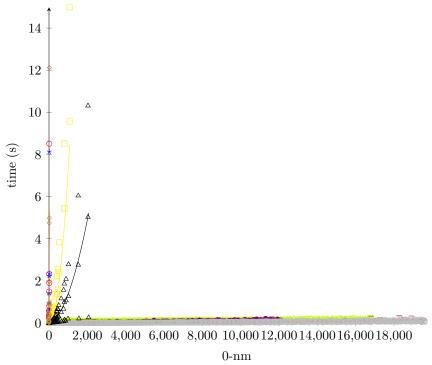


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(bottomup-bot $3 \cdot 10^{-3} exp(0.49 \cdot (0.49 \cdot (0.49$ rewrite-strat(topdown-bot  $5.36 \cdot 10^{-3} exp (0.46 \cdot ($ cps+cbn-real  $7.35 \cdot 10^{-6} \cdot x^2 - 1.33 \cdot 10^{-4} \cdot .$ cps+native-compute  $7.29 \cdot 10^{-11} \cdot x^2 + 5.71 \cdot 10^{-6} \cdot$ cps+lazy-real  $2.36 \cdot 10^{-10} \cdot x^2 + 4.08 \cdot 10^{-6} \cdot$ cps+vm-compute- $2.19\cdot 10^{-10}\cdot x^2 + 5.52\cdot 10^{-6}\cdot \\$  $_{\rm cps+cbv\text{-}real}$  $1.06\cdot 10^{-10}\cdot x^2 + 3.58\cdot 10^{-6}\cdot \\$ cps+simpl-real  $1.06 \cdot 10^{-6} \cdot x^2 + 3.42 \cdot 10^{-4} \cdot$ setoid-rewrite-re  $-7.01 \cdot 10^{-3} \cdot x^3 + 0.22 \cdot x^2 -$ 

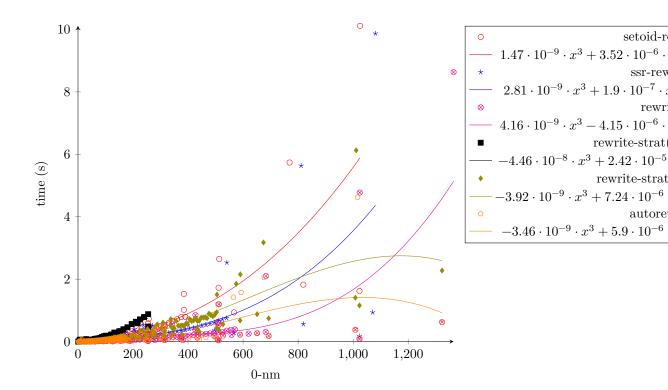
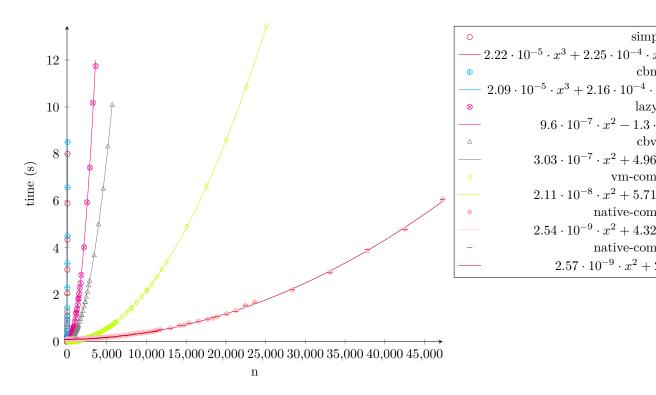


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



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 $9.6 \cdot 10^{-7} \cdot x^2 - 1.3 \cdot$ 

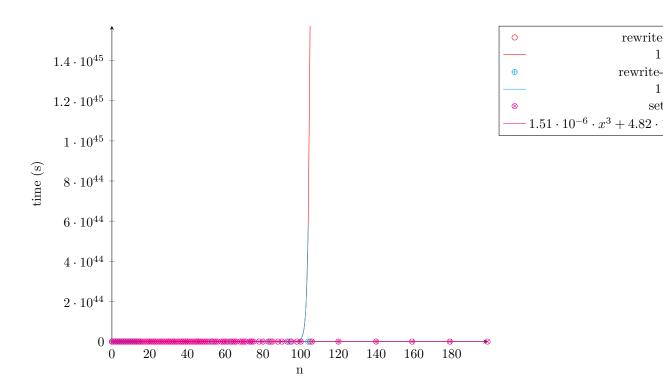
 $3.03 \cdot 10^{-7} \cdot x^2 + 4.96$ 

 $2.11 \cdot 10^{-8} \cdot x^2 + 5.71$ 

 $2.54 \cdot 10^{-9} \cdot x^2 + 4.32$ 

 $2.57 \cdot 10^{-9} \cdot x^2 + 3$ 

Figure 17: timing-sieve-of-eratosthenes



rewrite

rewrite-

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

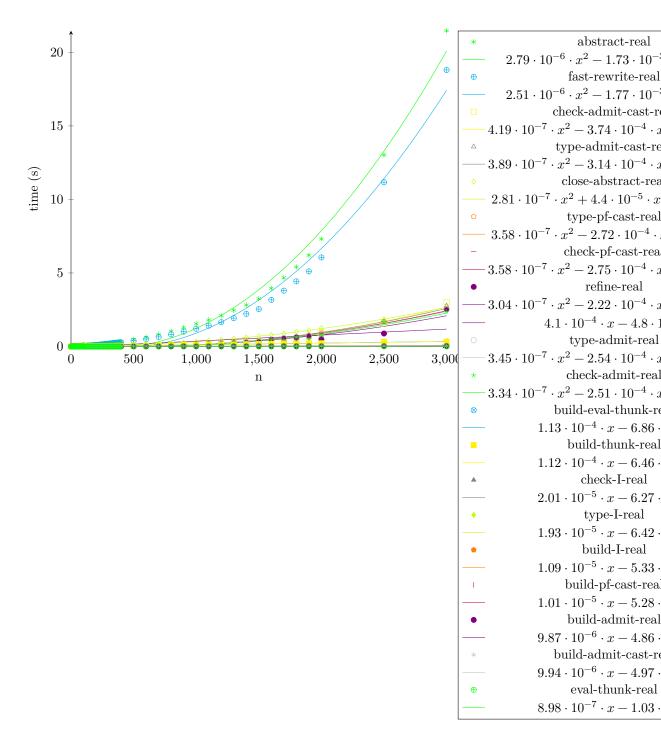


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2