

Figure 1: timing-pattern

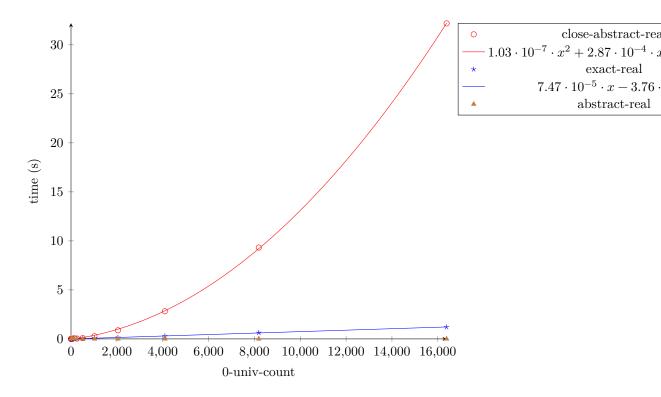
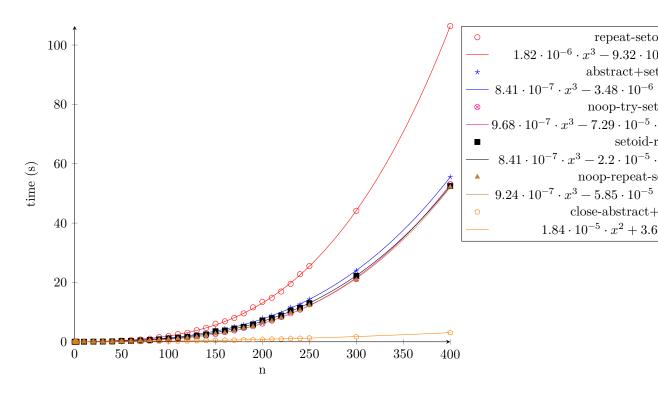


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

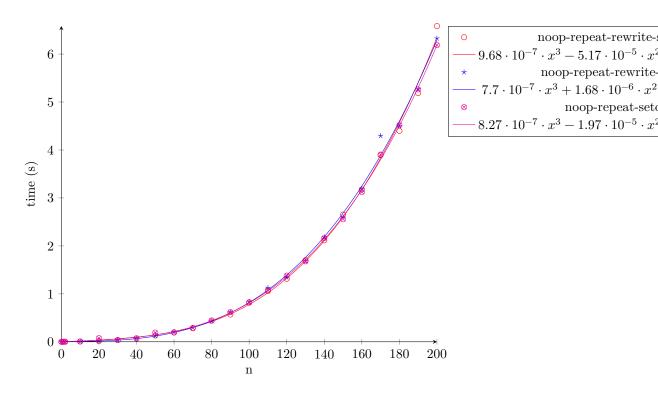
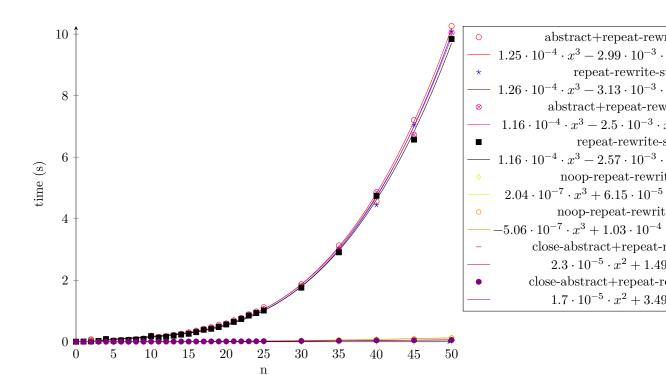
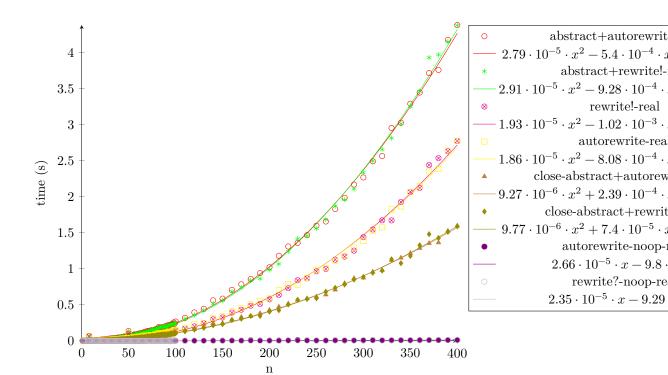


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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



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

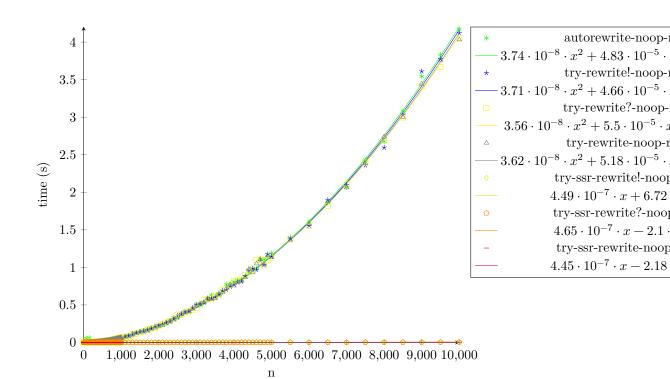
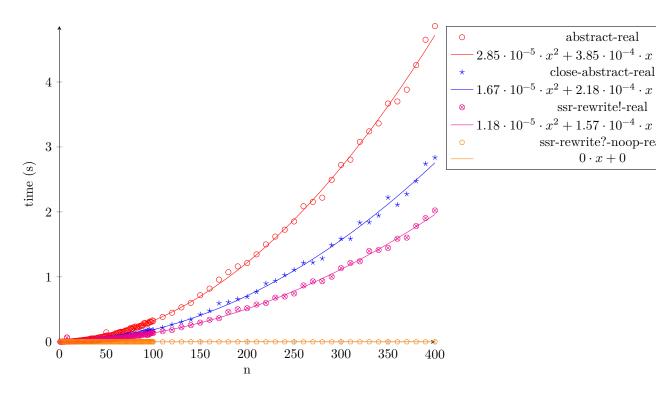
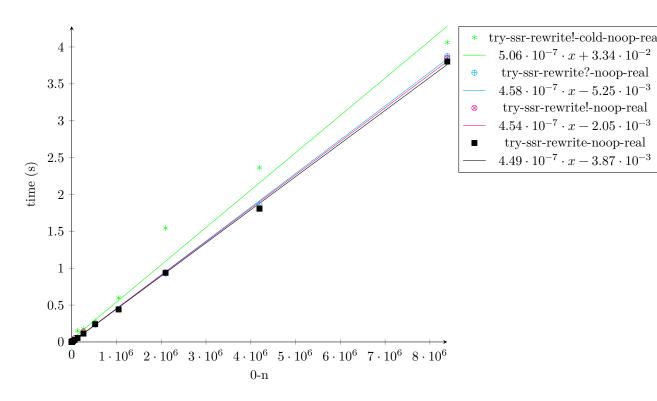


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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

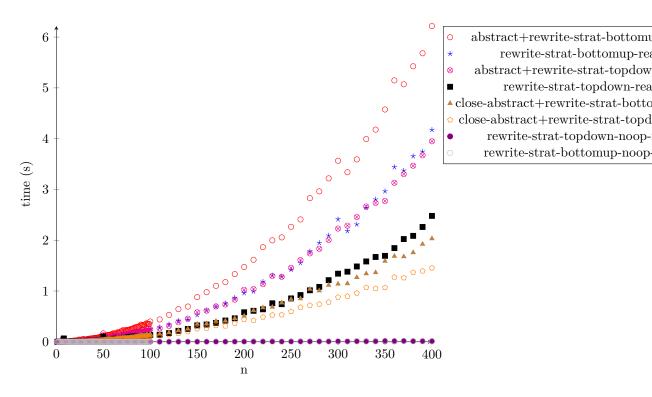


try-ssr-rewrite?-noop-real

try-ssr-rewrite!-noop-real

try-ssr-rewrite-noop-real

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

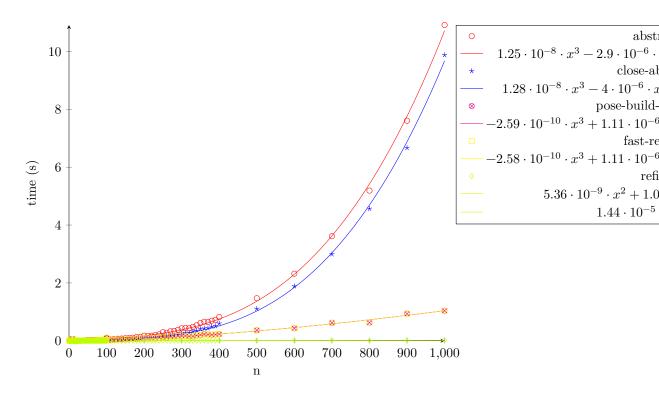


rewrite-strat-bottomup-rea abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

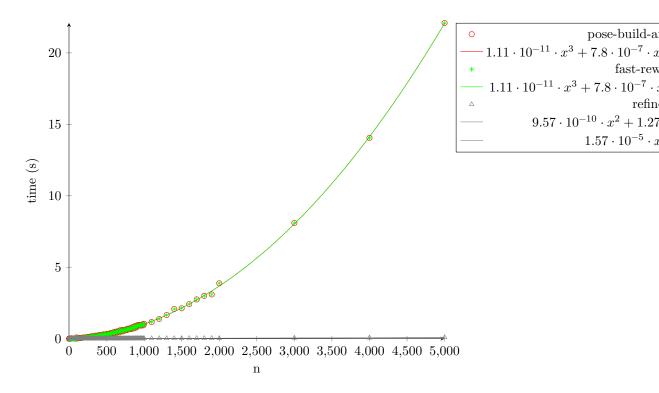
rewrite-strat-topdown-noop-

rewrite-strat-bottomup-noop-

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



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



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

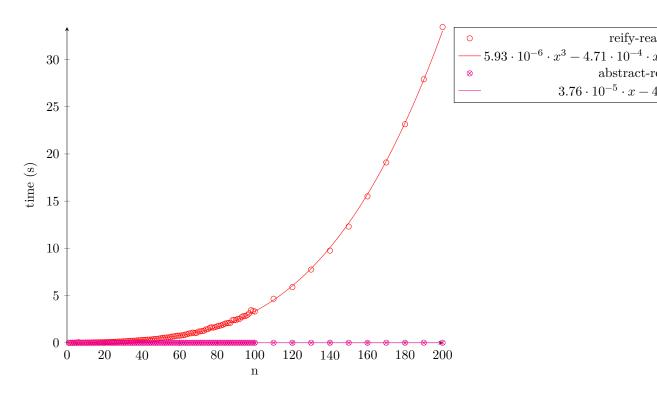


Figure 13: timing-typeclass-reification-let-in-HOAS

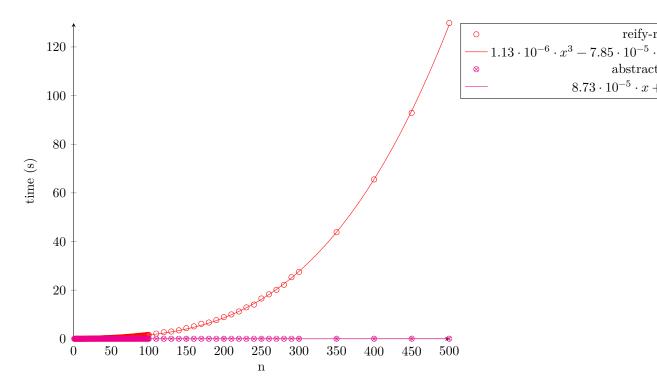


Figure 14: timing-typeclass-reification-let-in-PHOAS

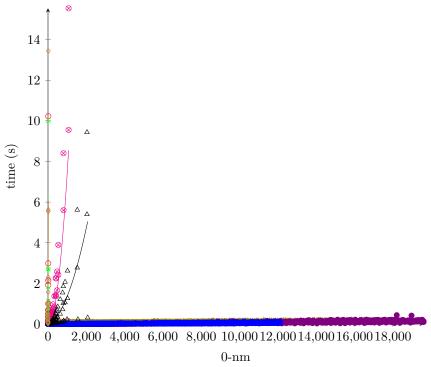


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1  $\,$ 

rewrite-strat(bottomup-bot $7.91 \cdot 10^{-3} exp(0.44 \cdot ($ rewrite-strat(topdown-bot  $6.99 \cdot 10^{-3} \exp{(0.45 \cdot ($ cps+cbn-real  $7.56\cdot 10^{-6}\cdot x^2 - 2.11\cdot 10^{-4}\cdot$ cps+native-compute  $5.97 \cdot 10^{-11} \cdot x^2 + 5.47 \cdot 10^{-6} \cdot$ cps+cbv-real $9.25 \cdot 10^{-11} \cdot x^2 + 3.74 \cdot 10^{-6} \cdot$ cps+lazy-real $1.89 \cdot 10^{-10} \cdot x^2 + 5.14 \cdot 10^{-6} \cdot \\$ cps+vm-compute- $1.68\cdot 10^{-10}\cdot x^2 + 4.32\cdot 10^{-6}\cdot \\$ cps+simpl-real  $1 \cdot 10^{-6} \cdot x^2 + 3.7 \cdot 10^{-4} \cdot x$ setoid-rewrite-re

 $-7.99 \cdot 10^{-3} \cdot x^3 + 0.25 \cdot x^2 -$ 

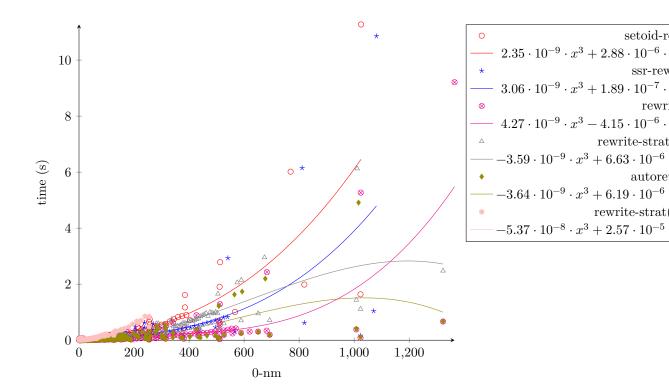
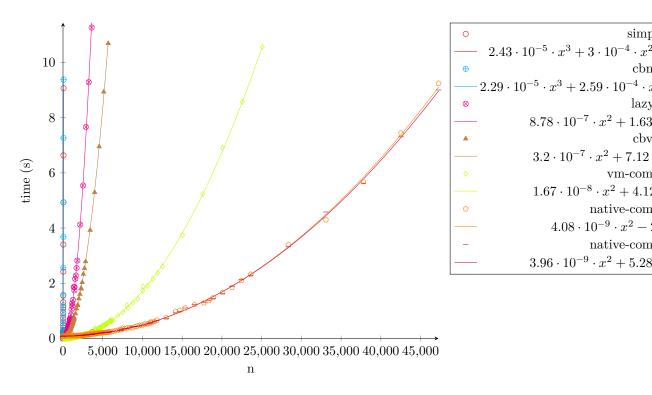


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



 $8.78 \cdot 10^{-7} \cdot x^2 + 1.63$ 

 $3.2\cdot 10^{-7}\cdot x^2 + 7.12$ 

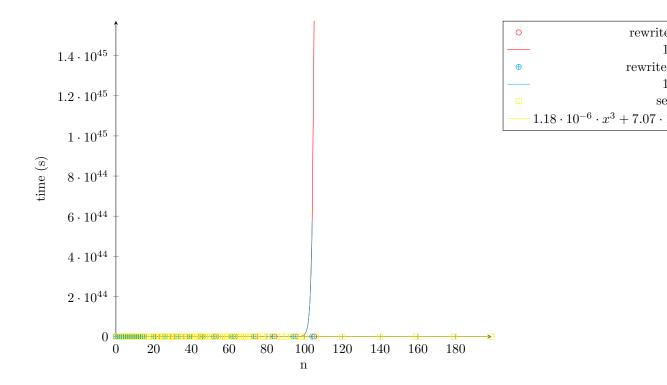
vm-com  $1.67 \cdot 10^{-8} \cdot x^2 + 4.12$ 

 $3.96 \cdot 10^{-9} \cdot x^2 + 5.28$ 

native-com  $4.08 \cdot 10^{-9} \cdot x^2 - 5$ 

native-com

 $Figure\ 17:\ timing\mbox{-sieve-of-eratos} thenes$ 



rewrite

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