

Figure 1: timing-pattern

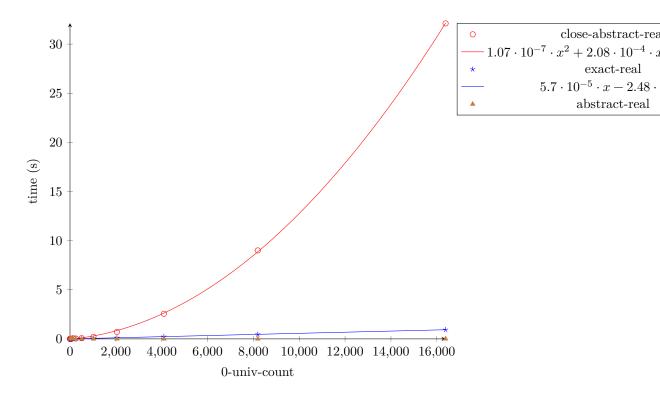
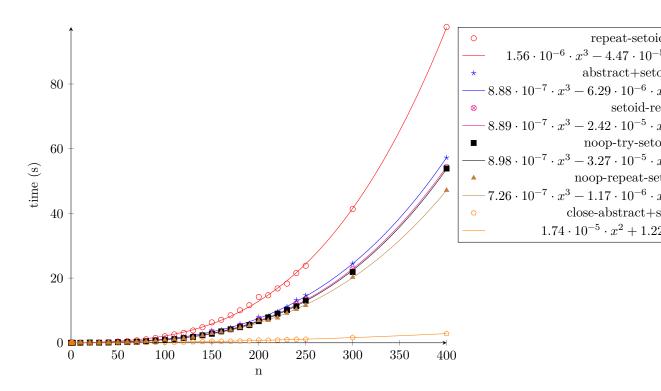


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

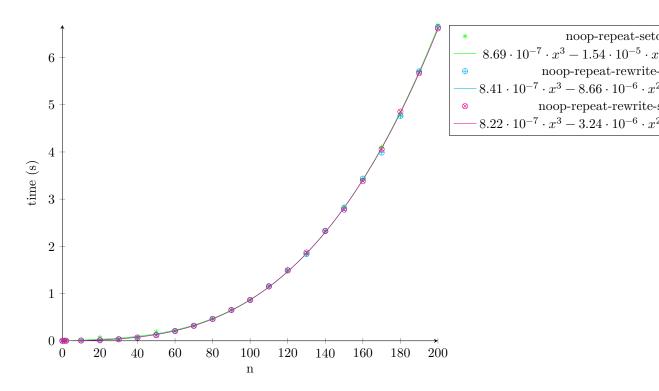
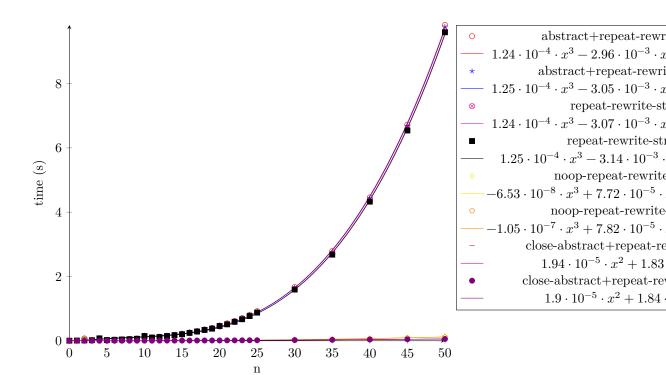


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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

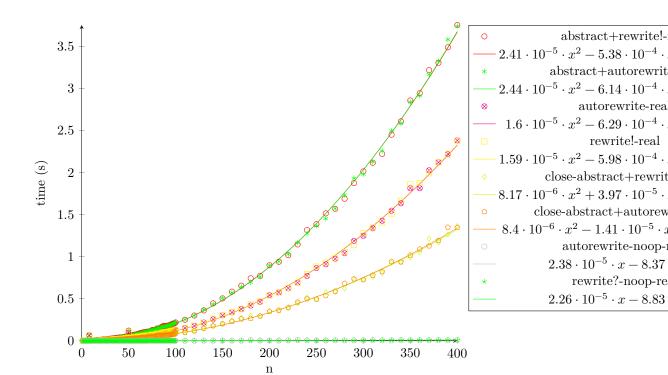
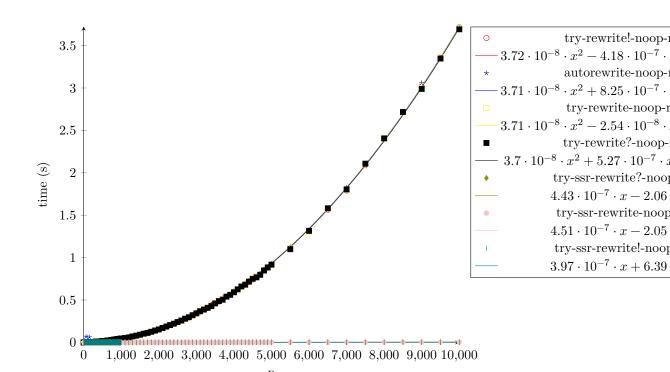
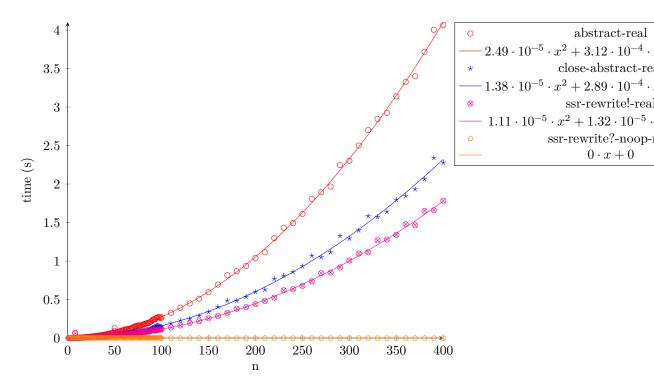


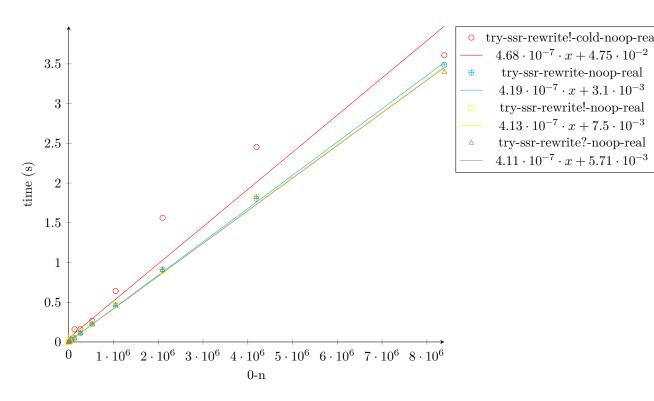
Figure 6: timing-rewrite-repeated-app-autorewrite



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



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



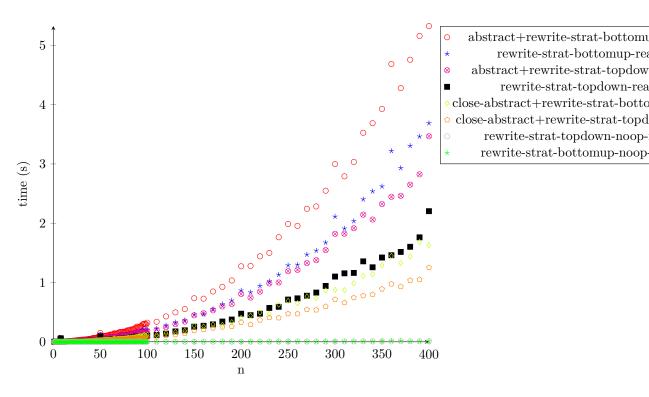
 $4.68 \cdot 10^{-7} \cdot x + 4.75 \cdot 10^{-2}$ 

try-ssr-rewrite-noop-real  $4.19\cdot 10^{-7}\cdot x + 3.1\cdot 10^{-3}$ 

try-ssr-rewrite!-noop-real  $4.13\cdot 10^{-7}\cdot x + 7.5\cdot 10^{-3}$ try-ssr-rewrite?-noop-real

 $4.11\cdot 10^{-7}\cdot x + 5.71\cdot 10^{-3}$ 

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

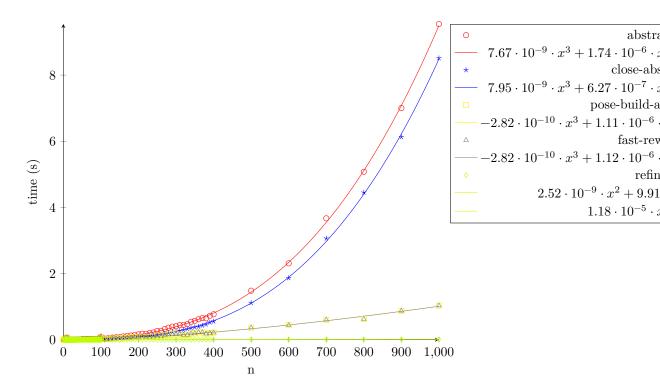


 $abstract + rewrite - strat - bottom \\ \\$ 

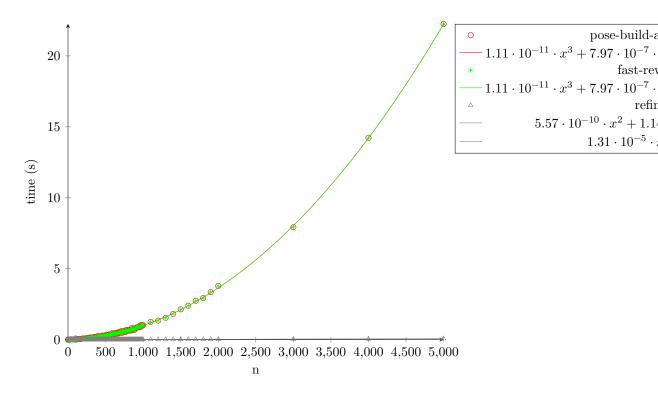
rewrite-strat-bottomup-rea abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

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

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



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



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

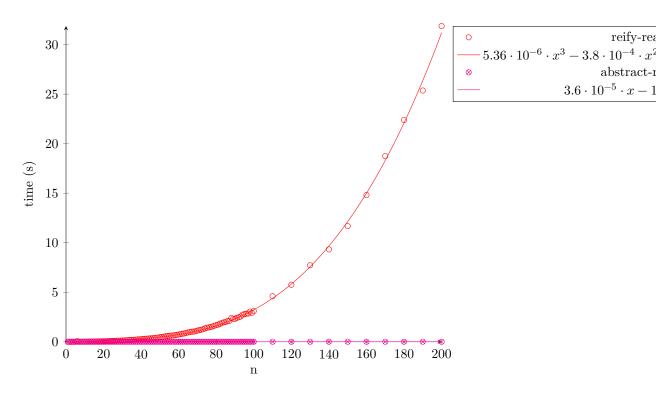


Figure 13: timing-typeclass-reification-let-in-HOAS

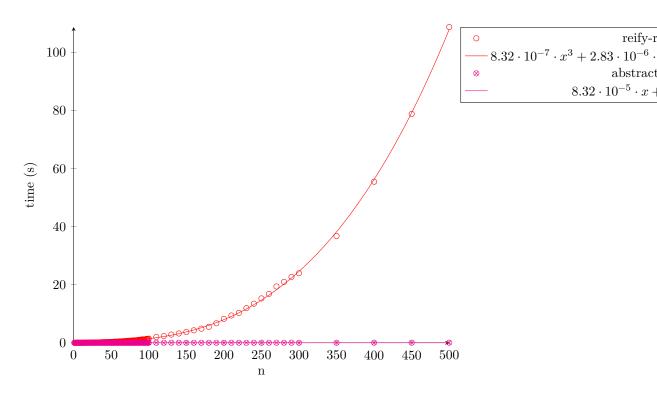


Figure 14: timing-typeclass-reification-let-in-PHOAS

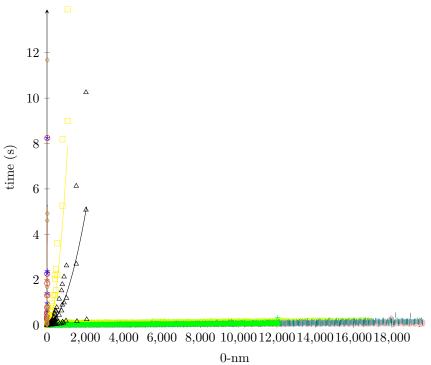


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

rewrite-strat(bottomup-bot  $4.36 \cdot 10^{-3} exp (0.47 \cdot ($ rewrite-strat(topdown-bot  $5.02 \cdot 10^{-3} \exp{(0.46 \cdot ($ cps+cbn-real  $6.79 \cdot 10^{-6} \cdot x^2 - 4.39 \cdot 10^{-6} \cdot .$ cps+native-compute  $2.17 \cdot 10^{-11} \cdot x^2 + 6 \cdot 10^{-6} \cdot x$  $\operatorname{cps+cbv-real}$  $8.08\cdot 10^{-11}\cdot x^2 + 3.64\cdot 10^{-6}\cdot$ cps+lazy-real $2.28 \cdot 10^{-10} \cdot x^2 + 4 \cdot 10^{-6} \cdot x$ cps+vm-compute- $1.67\cdot 10^{-10}\cdot x^2 + 4.73\cdot 10^{-6}\cdot \\$ cps+simpl-real  $1.1 \cdot 10^{-6} \cdot x^2 + 2.56 \cdot 10^{-4} \cdot x^2$ setoid-rewrite-re  $-6.81 \cdot 10^{-3} \cdot x^3 + 0.22 \cdot x^2 -$ 

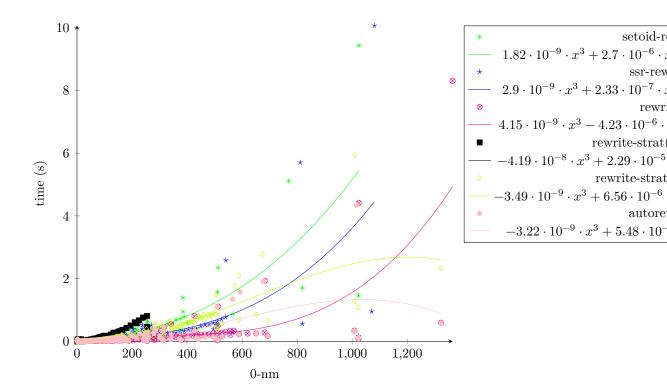
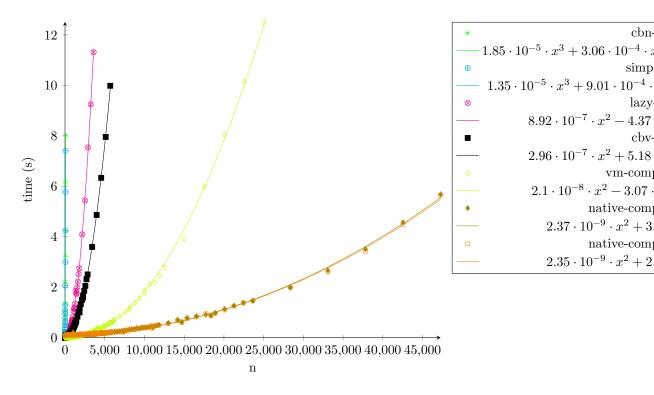


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



cbn-

simp

cbv-

vm-com

native-comp  $2.37 \cdot 10^{-9} \cdot x^2 + 3$ 

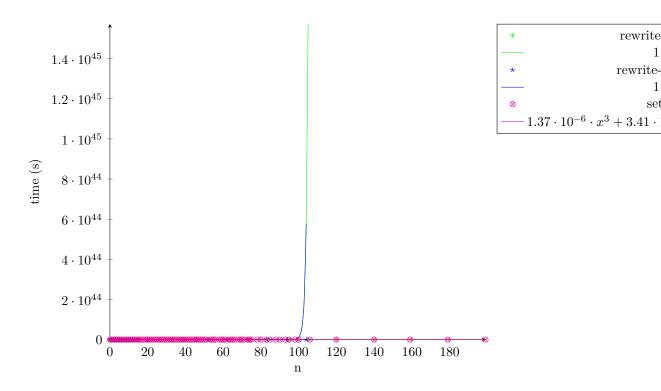
native-comp  $2.35 \cdot 10^{-9} \cdot x^2 + 2$ 

 $8.92 \cdot 10^{-7} \cdot x^2 - 4.37$ 

 $2.96\cdot 10^{-7}\cdot x^2 + 5.18$ 

 $2.1 \cdot 10^{-8} \cdot x^2 - 3.07$ 

Figure 17: timing-sieve-of-eratosthenes



rewrite

rewrite-

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