

Figure 1: timing-pattern

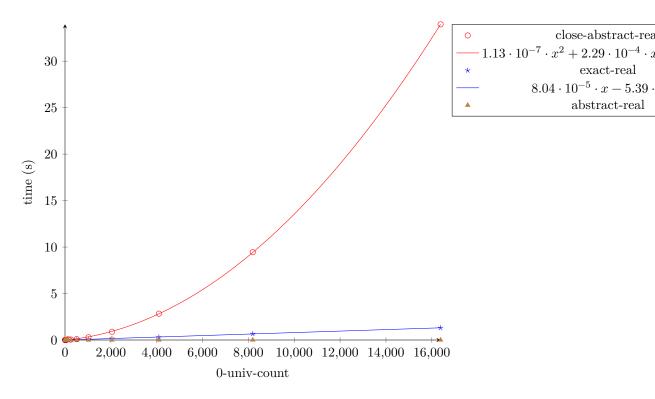
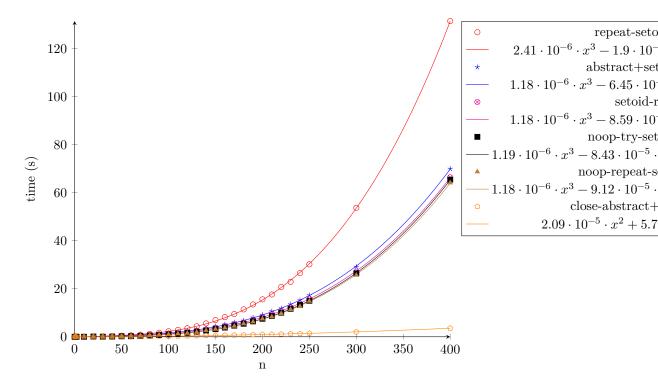


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

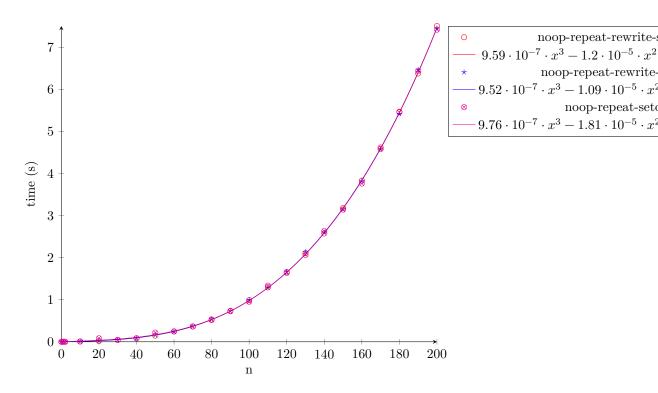
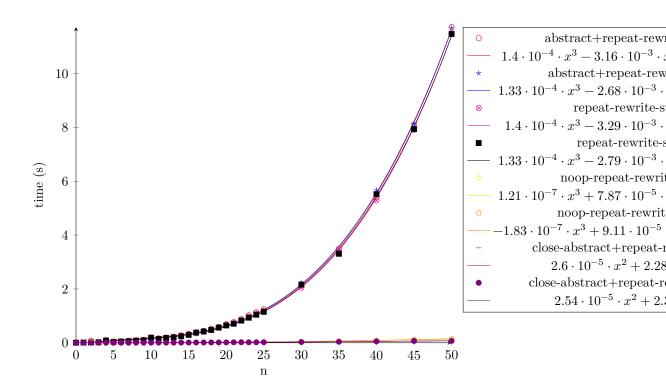
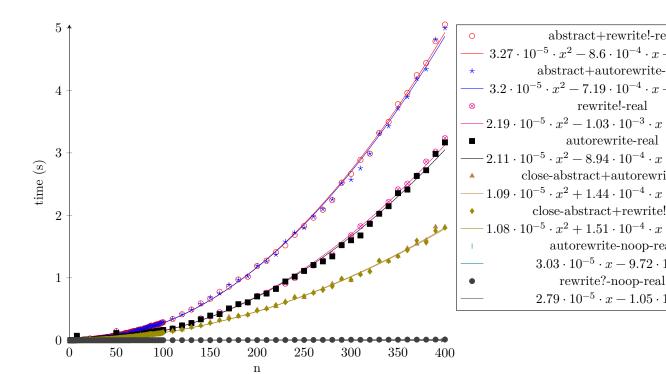


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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



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

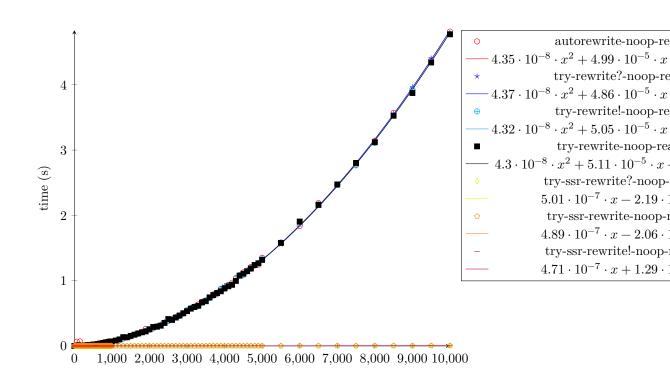
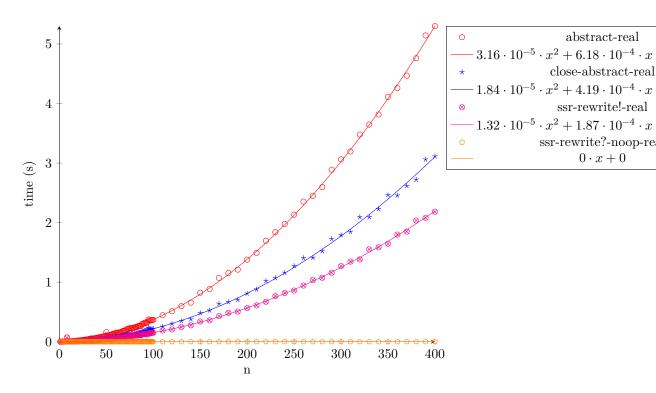


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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

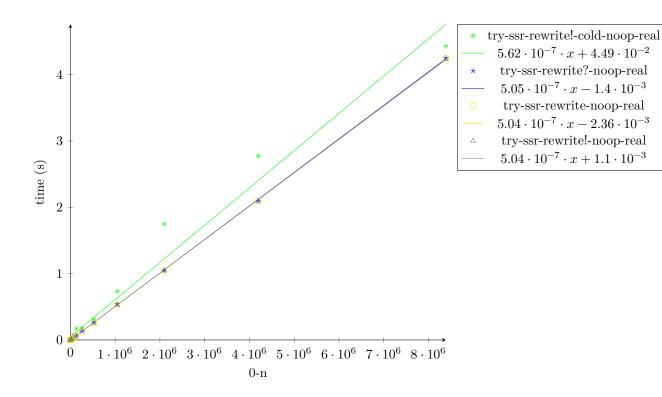
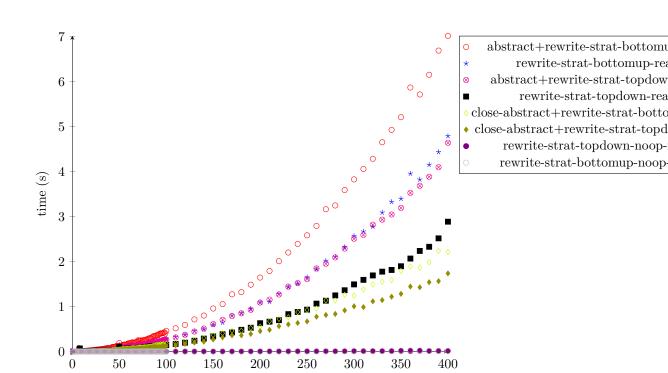


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



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

n

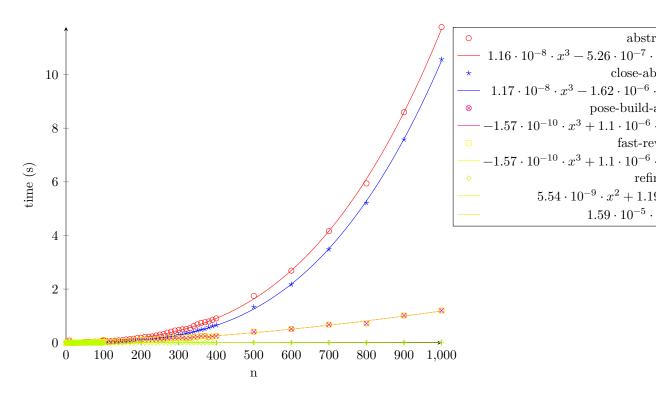
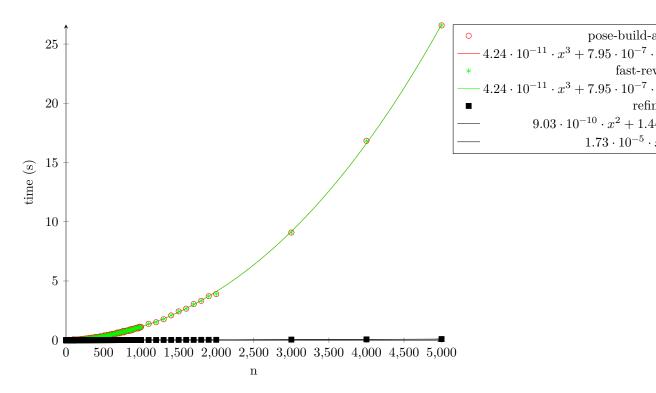


Figure 11: timing-rewrite-repeated-app-fast-rewrite



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

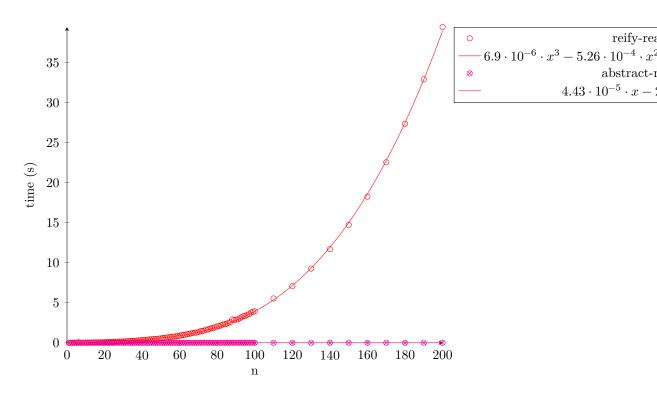


Figure 13: timing-typeclass-reification-let-in-HOAS

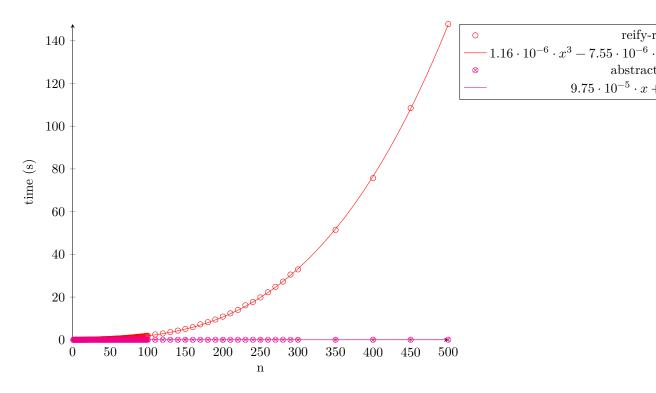
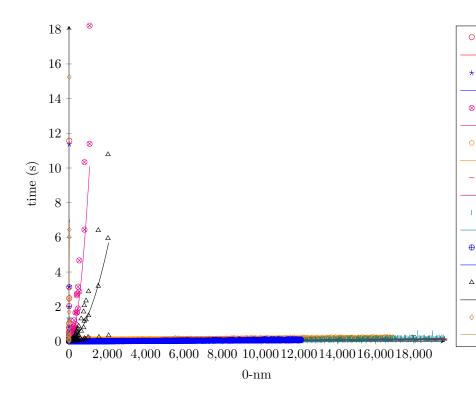


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot $6.99 \cdot 10^{-3} exp(0.46 \cdot ($

rewrite-strat(topdown-bot) $6.44 \cdot 10^{-3} \exp{(0.47 \cdot ($

 $8.84 \cdot 10^{-6} \cdot x^2 - 1.41 \cdot 10^{-4} \cdot x^2$

 $6.85\cdot 10^{-11}\cdot x^2 + 6.31\cdot 10^{-6}\cdot$

 $1.08 \cdot 10^{-10} \cdot x^2 + 4.22 \cdot 10^{-6} \cdot$

 $2.32 \cdot 10^{-10} \cdot x^2 + 5.18 \cdot 10^{-6} \cdot$

 $1.25 \cdot 10^{-10} \cdot x^2 + 5.96 \cdot 10^{-6}$

 $1.13 \cdot 10^{-6} \cdot x^2 + 4.18 \cdot 10^{-4} \cdot x^2$

 $-8.87 \cdot 10^{-3} \cdot x^3 + 0.28 \cdot x^2 -$

cps+cbn-real

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

 $\operatorname{cps+lazy-real}$

cps+simpl-real

setoid-rewrite-re

cps+vm-compute-

cps+native-compute

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

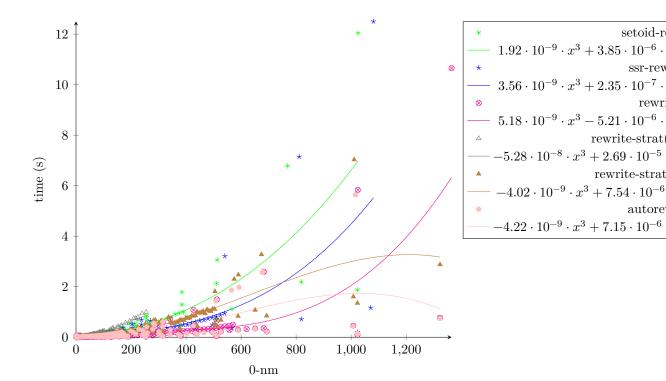
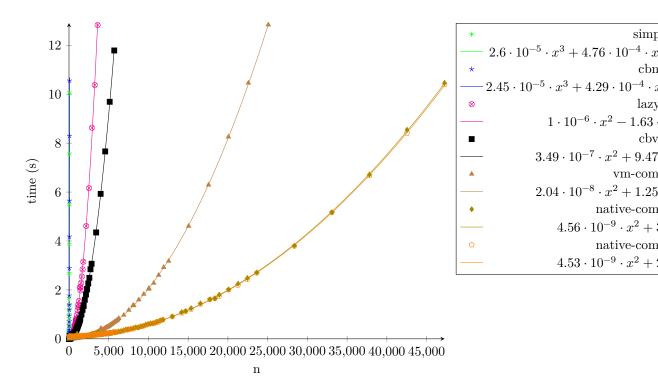


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

lazy

vm-com

native-com $4.56 \cdot 10^{-9} \cdot x^2 + 3$

native-com $4.53 \cdot 10^{-9} \cdot x^2 + 5$

 $1 \cdot 10^{-6} \cdot x^2 - 1.63$

 $3.49 \cdot 10^{-7} \cdot x^2 + 9.47$

 $2.04 \cdot 10^{-8} \cdot x^2 + 1.25$

Figure 17: timing-sieve-of-eratosthenes

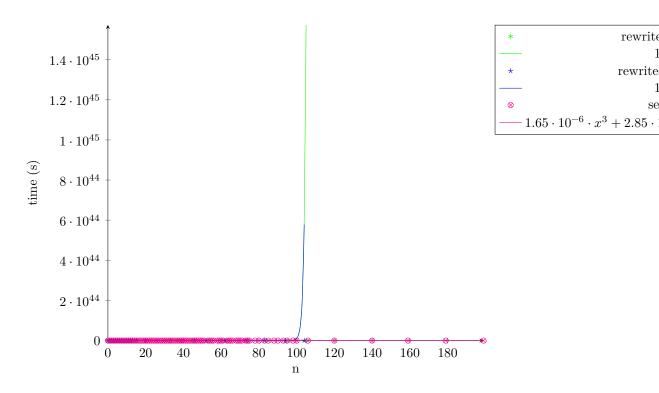


Figure 18: timing-rewrite-under-lets-plus-0 $\,$