

Figure 1: timing-pattern

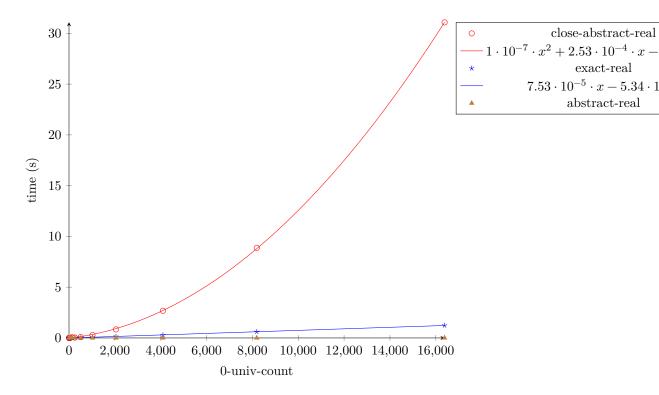
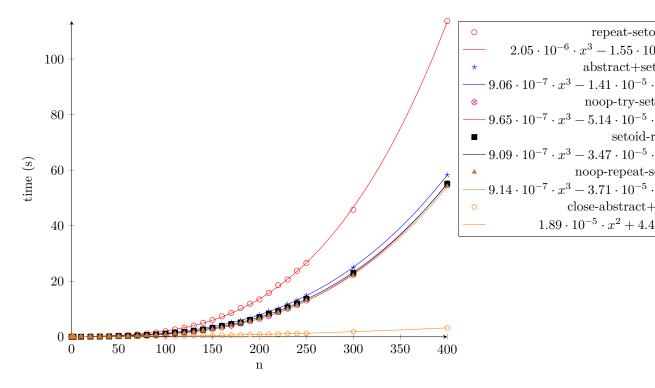
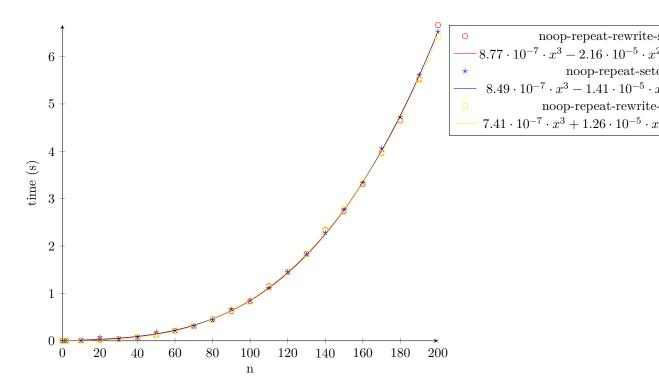


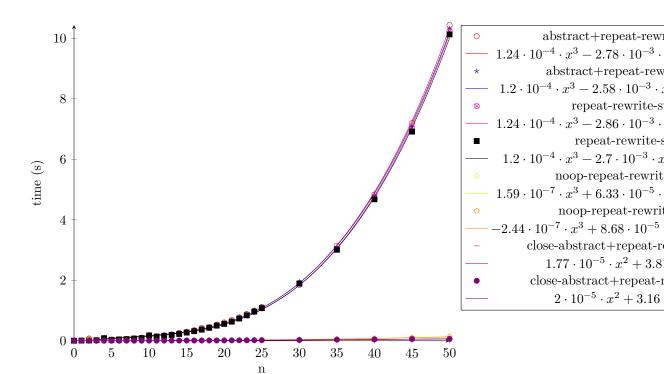
Figure 2: timing-n-polymorphic-universes param-1-n 0



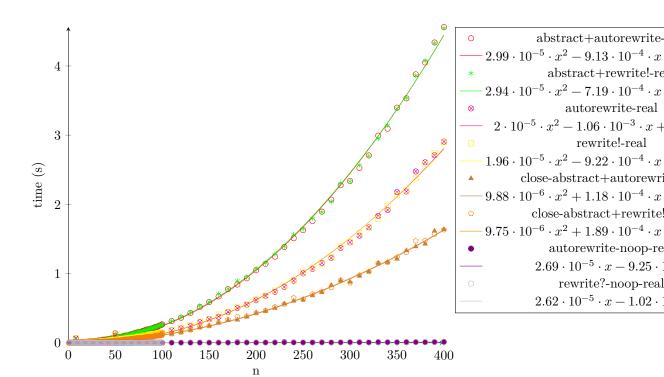
 $Figure \ 3: \ timing-repeat-setoid-rewrite-under-binders$



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



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



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

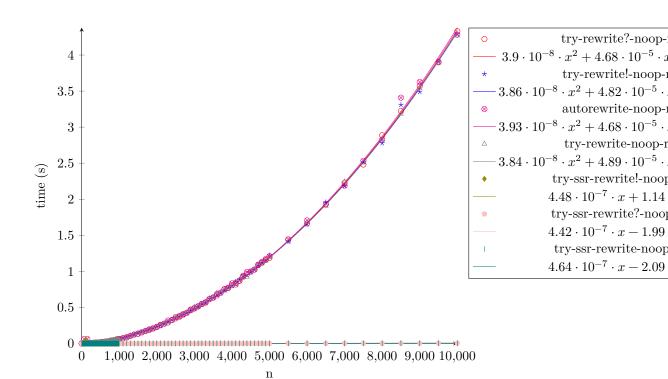


Figure 7: timing-rewrite-repeated-app-autorewrite-noop

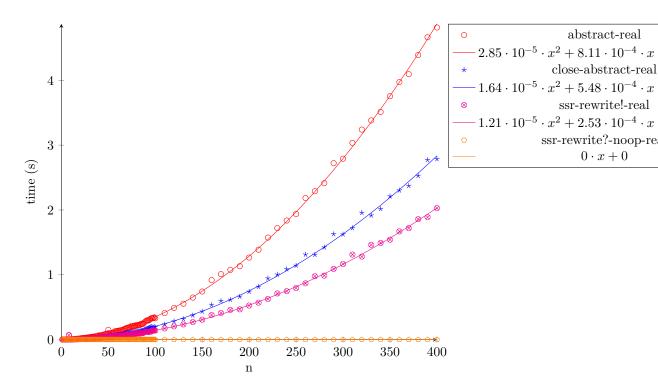
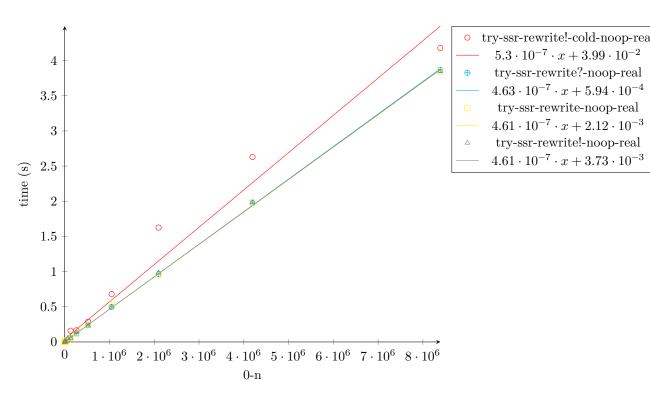


Figure 8: timing-rewrite-repeated-app-ssrrewrite



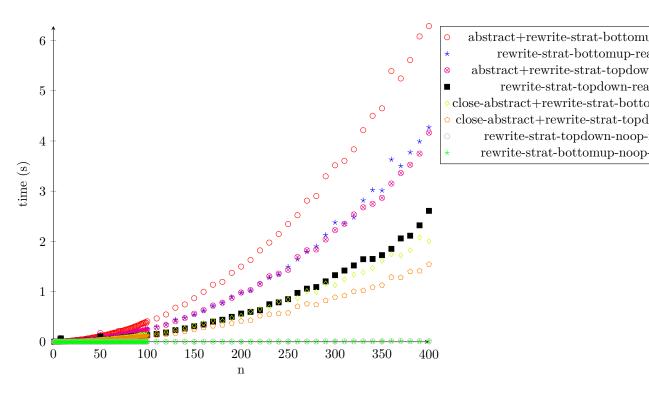
 $5.3 \cdot 10^{-7} \cdot x + 3.99 \cdot 10^{-2}$

try-ssr-rewrite?-noop-real $4.63\cdot 10^{-7}\cdot x + 5.94\cdot 10^{-4}$

try-ssr-rewrite-noop-real $4.61\cdot 10^{-7}\cdot x + 2.12\cdot 10^{-3}$

try-ssr-rewrite!-noop-real $4.61\cdot 10^{-7}\cdot x + 3.73\cdot 10^{-3}$

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

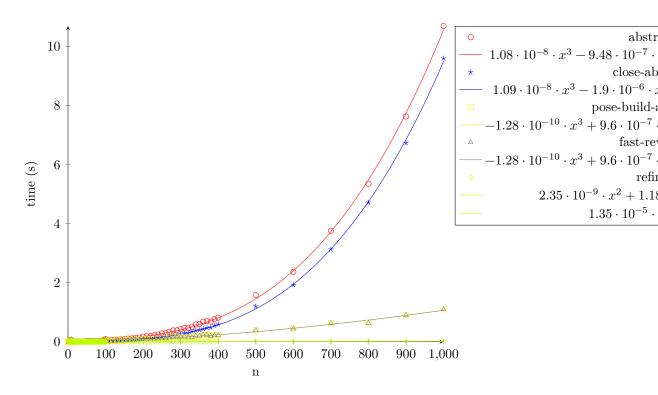


 $abstract + rewrite - strat - bottom \\ \\$ rewrite-strat-bottomup-rea abstract + rewrite - strat - topdowrewrite-strat-topdown-rea

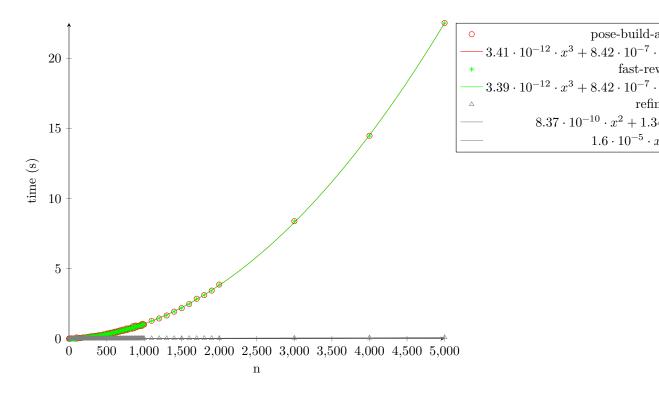
rewrite-strat-topdown-noop-

rewrite-strat-bottomup-noop-

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



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



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

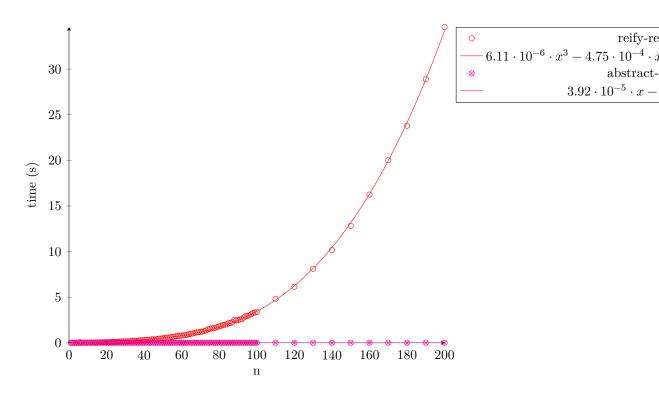


Figure 13: timing-typeclass-reification-let-in-HOAS

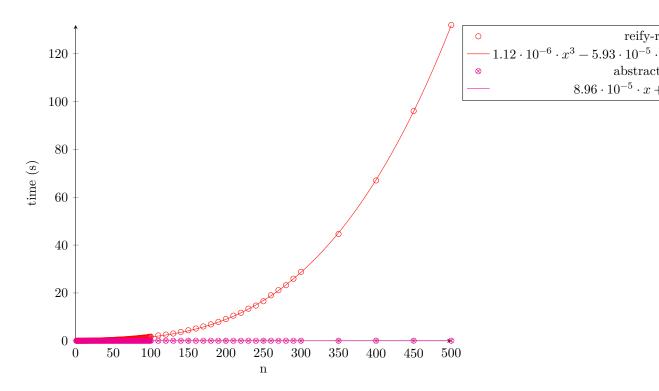
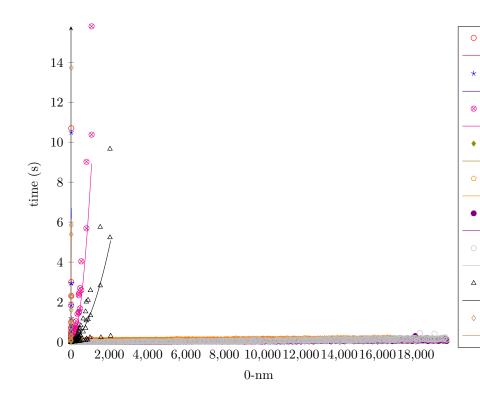


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot $6.62 \cdot 10^{-3} exp(0.46 \cdot ($

rewrite-strat (topdown-bot 7.06 \cdot 10⁻³ exp (0.46 \cdot (

 $7.86\cdot 10^{-6}\cdot x^2 - 1.84\cdot 10^{-4}\cdot x^2 + 1.84\cdot 1$

 $1.29 \cdot 10^{-10} \cdot x^2 + 4.97 \cdot 10^{-6} \cdot$

 $4.82 \cdot 10^{-11} \cdot x^2 + 5.8 \cdot 10^{-6} \cdot x^$

 $1.02 \cdot 10^{-10} \cdot x^2 + 3.7 \cdot 10^{-6} \cdot x^2$

 $2.33\cdot 10^{-10}\cdot x^2 + 4.39\cdot 10^{-6}\cdot \\$

 $9.93 \cdot 10^{-7} \cdot x^2 + 4.06 \cdot 10^{-4} \cdot x^2$

 $-8.02 \cdot 10^{-3} \cdot x^3 + 0.26 \cdot x^2 -$

cps+cbn-real

cps+cbv-real

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

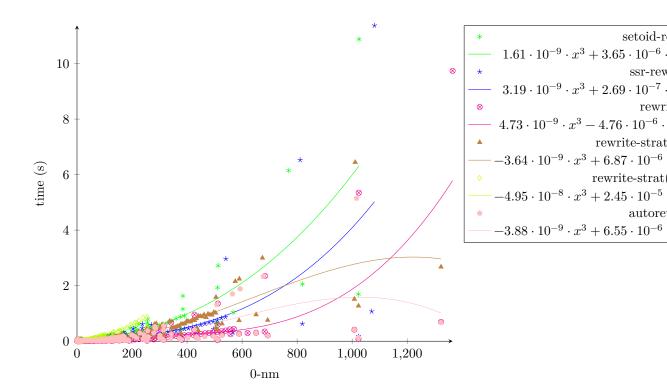
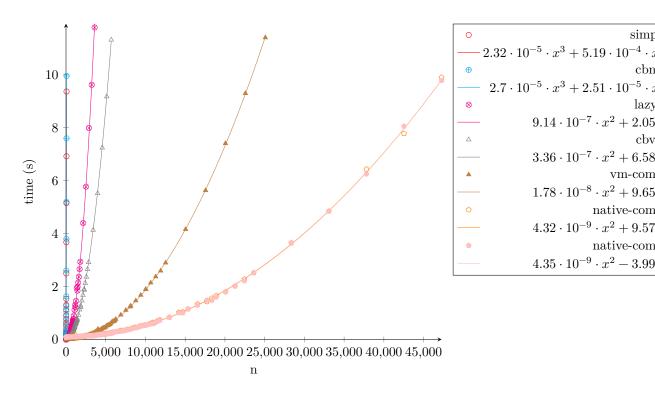


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

lazy

vm-com

native-com

native-com

 $9.14 \cdot 10^{-7} \cdot x^2 + 2.05$

 $3.36 \cdot 10^{-7} \cdot x^2 + 6.58$

 $1.78 \cdot 10^{-8} \cdot x^2 + 9.65$

 $4.32 \cdot 10^{-9} \cdot x^2 + 9.57$

 $4.35 \cdot 10^{-9} \cdot x^2 - 3.99$

Figure 17: timing-sieve-of-eratosthenes

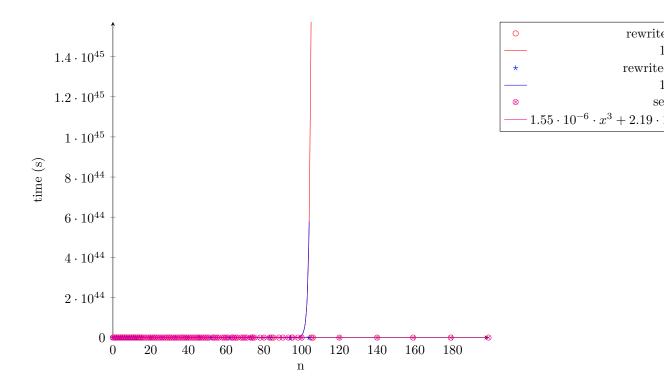


Figure 18: timing-rewrite-under-lets-plus-0 $\,$