

Figure 1: timing-pattern

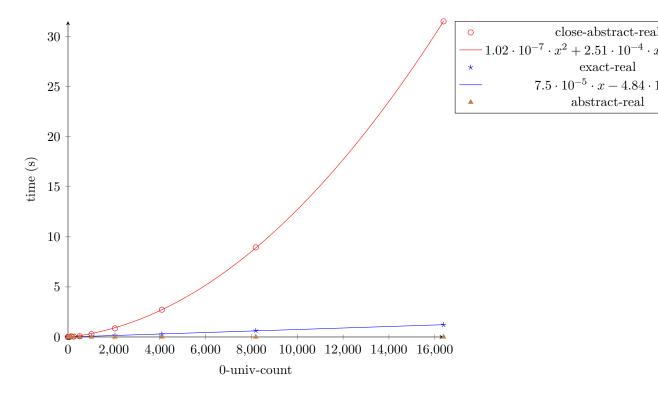
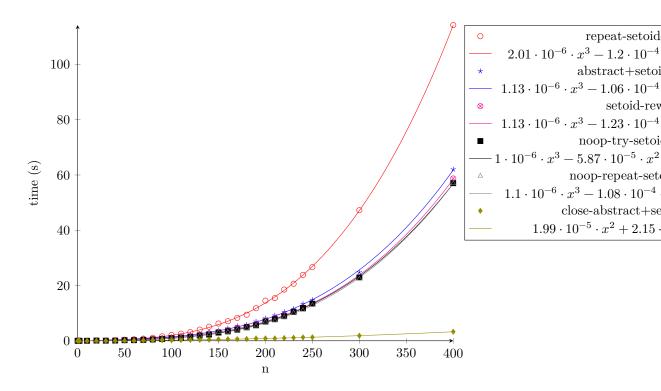


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

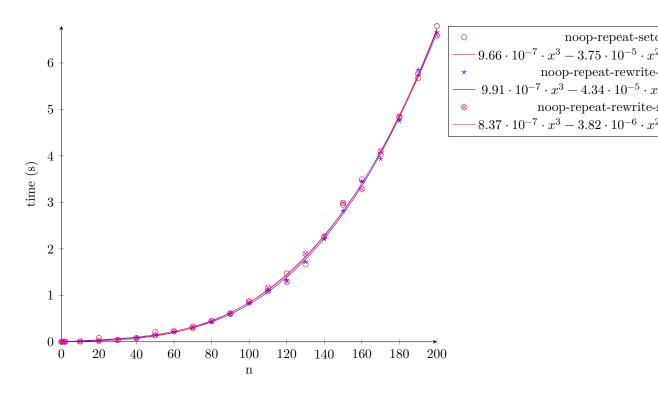
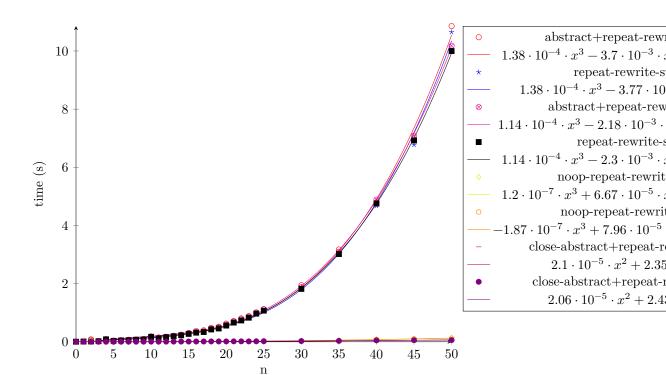
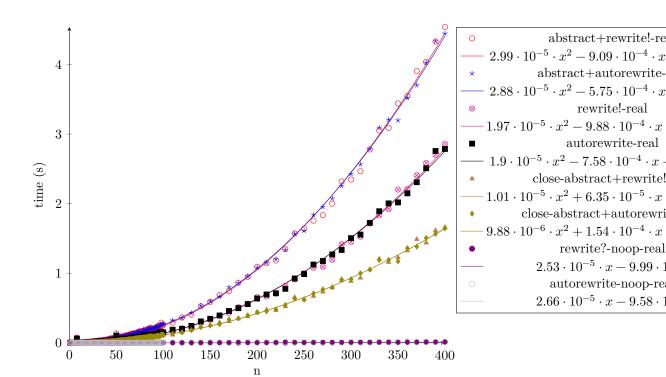


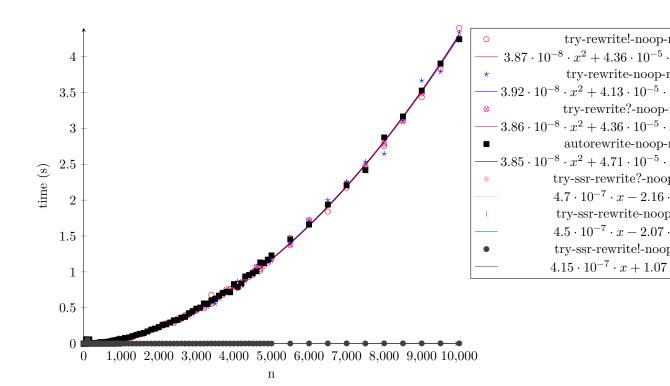
Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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



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



 $Figure~7:~timing\mbox{-rewrite-repeated-app-autorewrite-noop}$

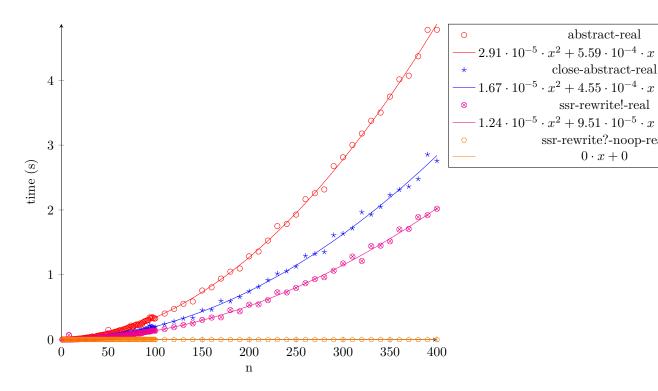


Figure 8: timing-rewrite-repeated-app-ssrrewrite

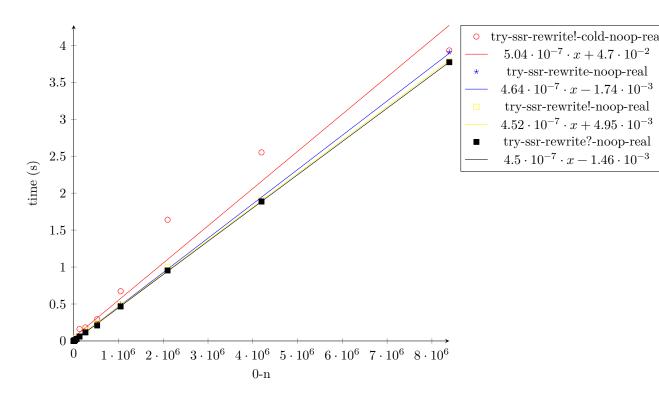
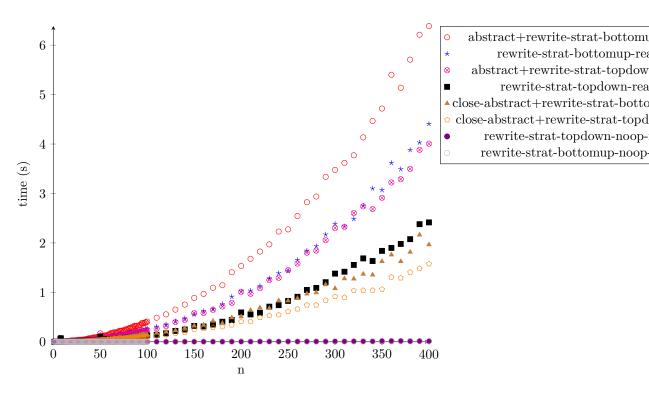


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\ 1$



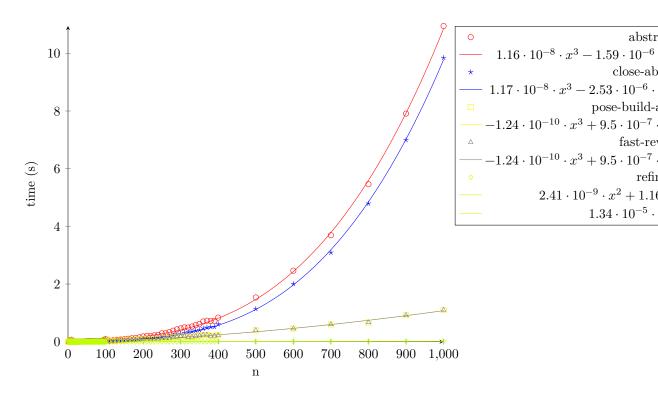
 $abstract + rewrite - strat - bottom \\ \\$

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

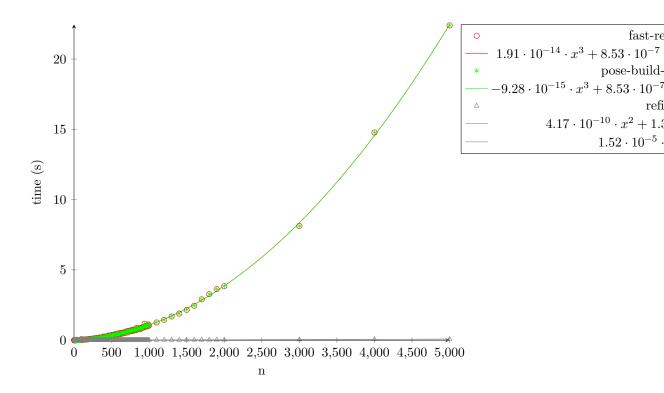
rewrite-strat-topdown-noop-

rewrite-strat-bottomup-noop-

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



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



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

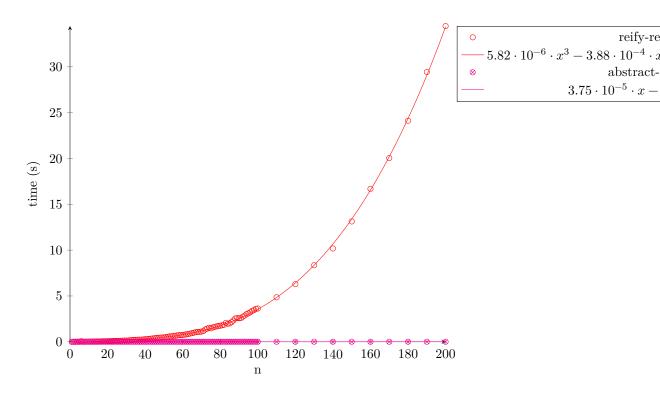


Figure 13: timing-typeclass-reification-let-in-HOAS

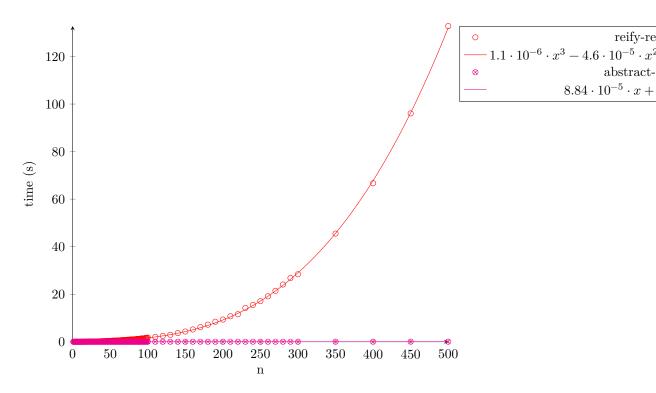
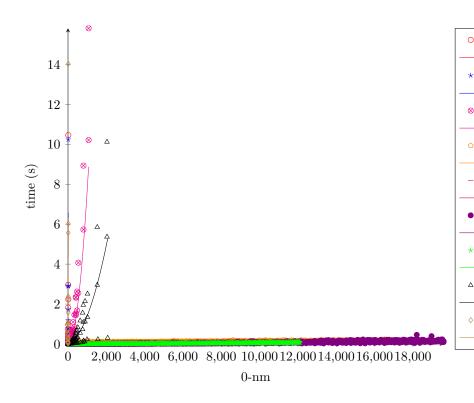


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot $6.86 \cdot 10^{-3} \exp{(0.46 \cdot ($

rewrite-strat (topdown-bot) 6.91 \cdot 10⁻³ exp (0.46 \cdot (

 $7.81\cdot 10^{-6}\cdot x^2 - 1.82\cdot 10^{-4}\cdot x^{-1}$

 $5.28 \cdot 10^{-11} \cdot x^2 + 5.84 \cdot 10^{-6} \cdot$

 $1.2 \cdot 10^{-10} \cdot x^2 + 3.48 \cdot 10^{-6} \cdot x^2$

 $2.23 \cdot 10^{-10} \cdot x^2 + 4.64 \cdot 10^{-6} \cdot$

 $1.28\cdot 10^{-10}\cdot x^2 + 5.16\cdot 10^{-6}\cdot$

 $1.06 \cdot 10^{-6} \cdot x^2 + 3.54 \cdot 10^{-4} \cdot x^2 + 3.54 \cdot 10^{-4}$

 $-8.26 \cdot 10^{-3} \cdot x^3 + 0.26 \cdot x^2 - \\$

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

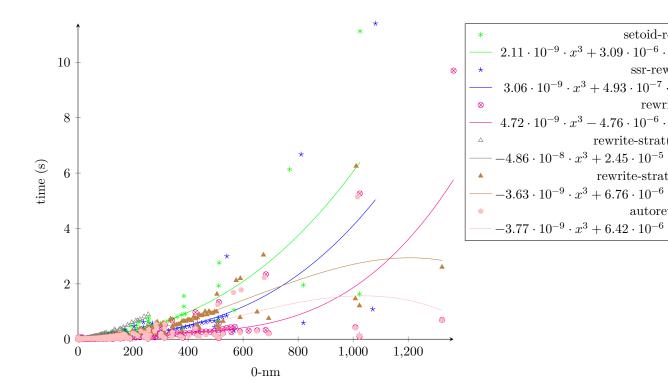
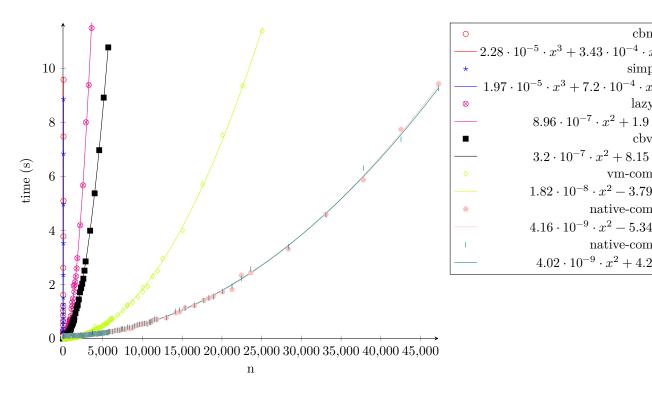


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



cbn

lazy

vm-com

native-com

native-com

 $8.96 \cdot 10^{-7} \cdot x^2 + 1.9$

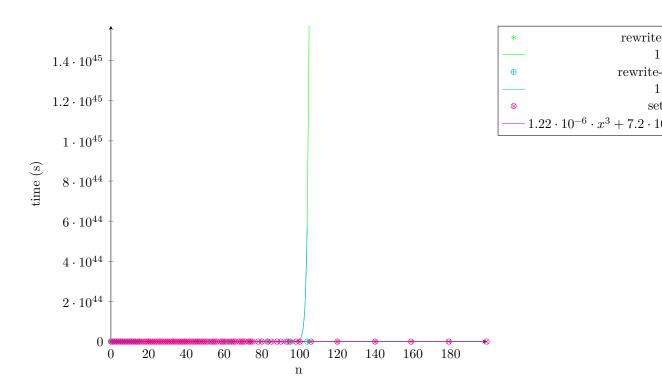
 $3.2\cdot 10^{-7}\cdot x^2 + 8.15$

 $1.82 \cdot 10^{-8} \cdot x^2 - 3.79$

 $4.16 \cdot 10^{-9} \cdot x^2 - 5.34$

 $4.02 \cdot 10^{-9} \cdot x^2 + 4.2$

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



rewrite

rewrite-

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