

Figure 1: timing-pattern

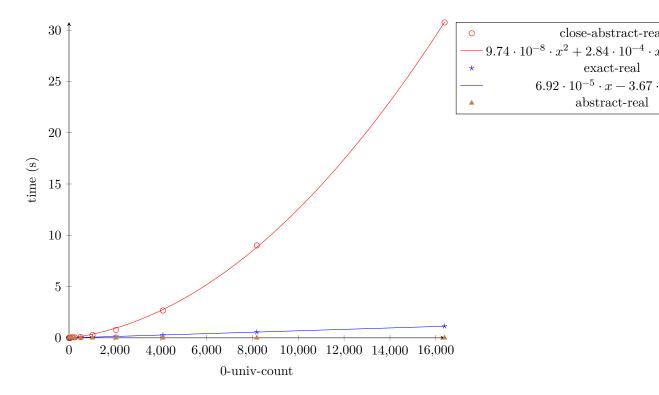
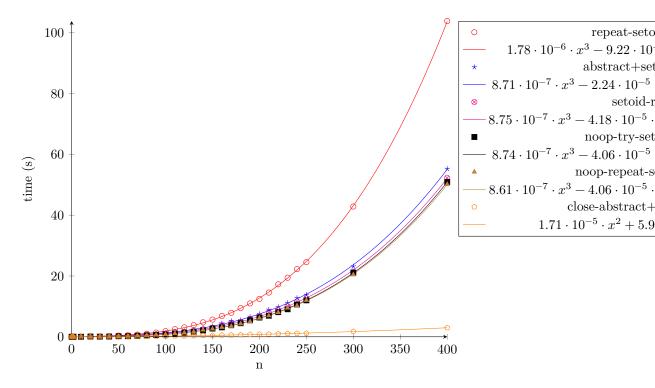


Figure 2: timing-n-polymorphic-universes param-1-n 0



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

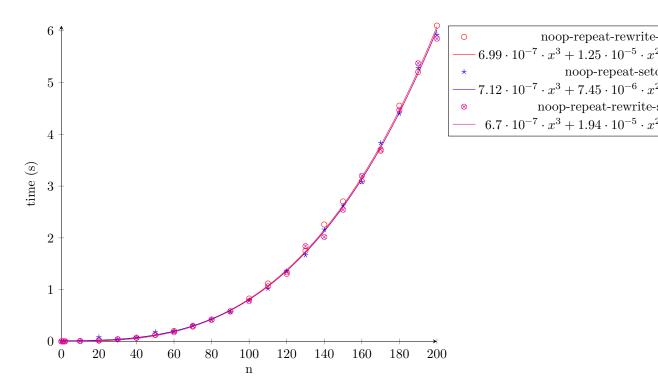


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

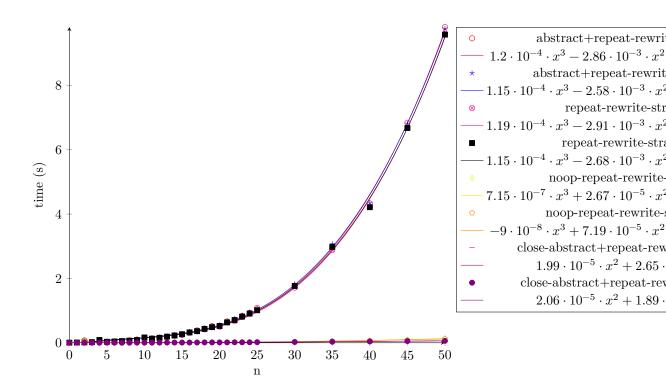
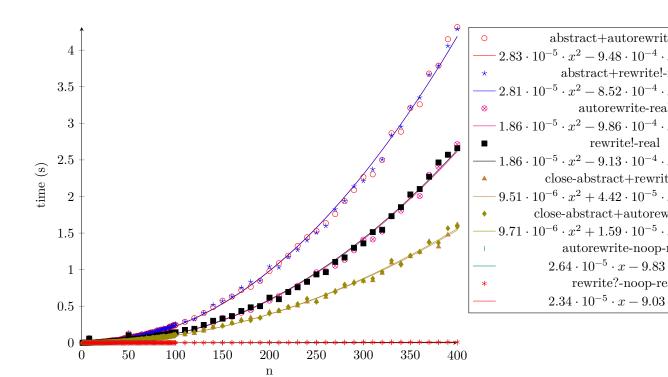
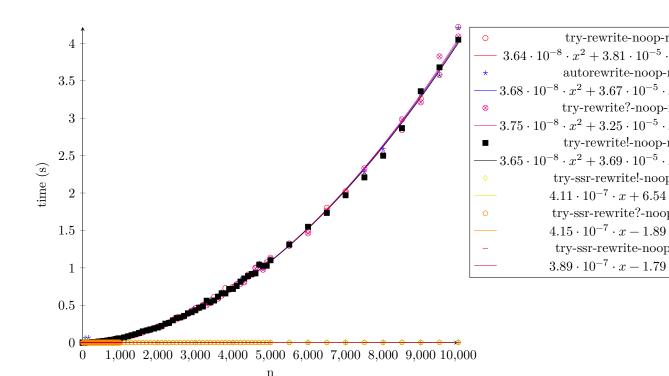


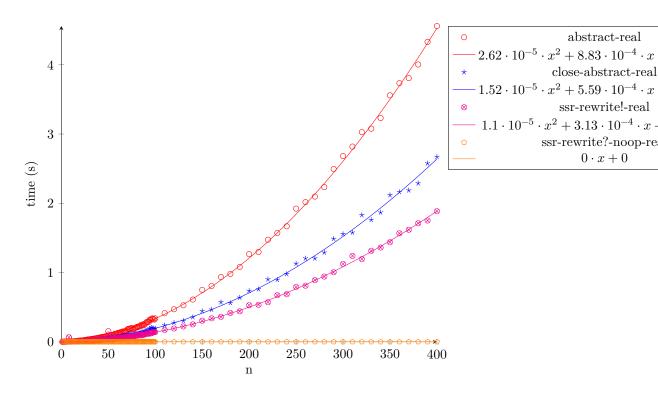
Figure 5: timing-rewrite-strat-under-binders



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



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



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

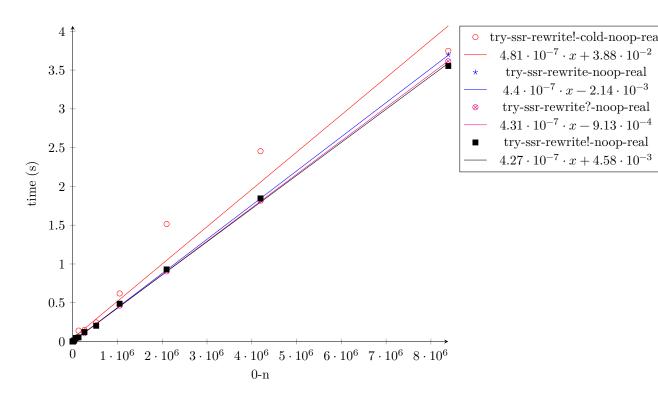
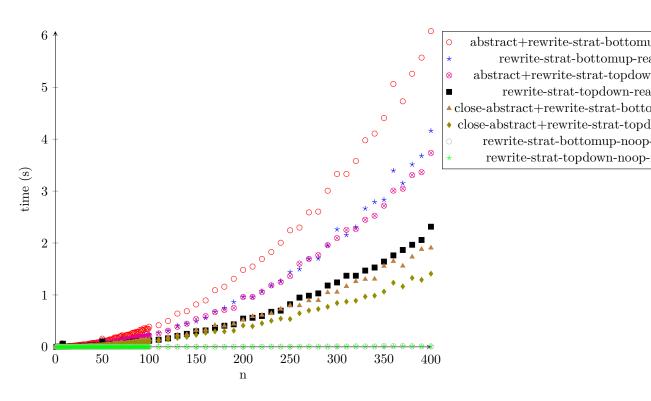


Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn  $\ 1$ 

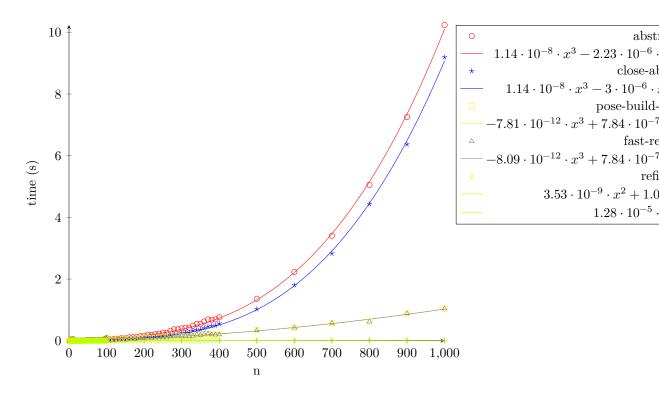


rewrite-strat-bottomup-rea abstract + rewrite - strat - topdow

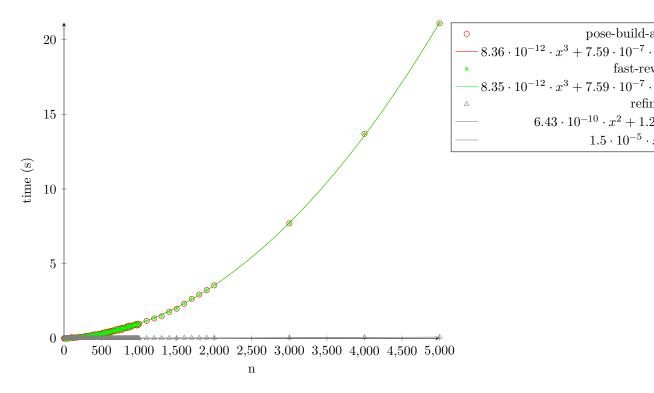
rewrite-strat-topdown-rea

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

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



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



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

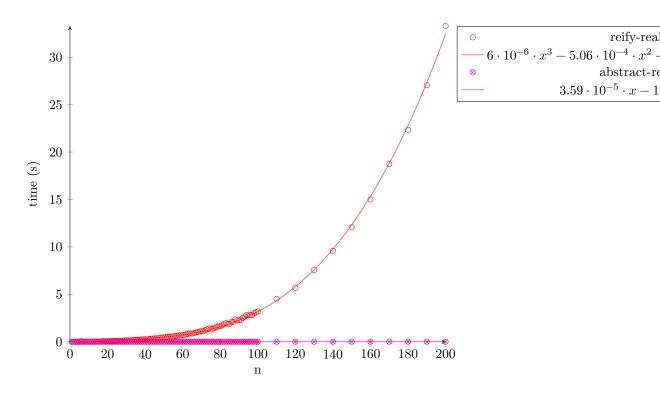


Figure 13: timing-typeclass-reification-let-in-HOAS

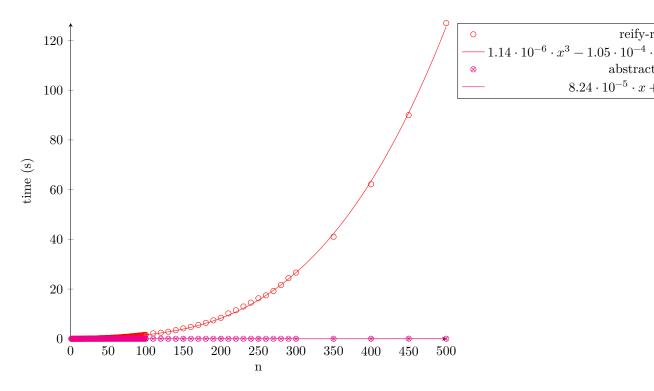
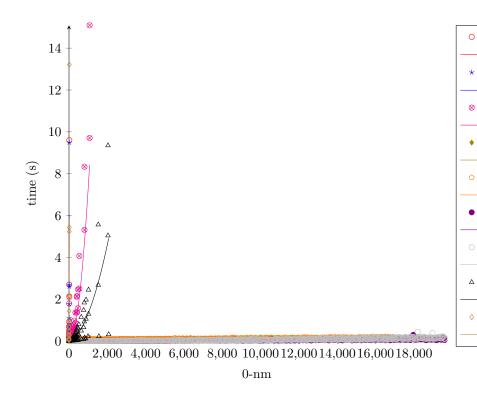


Figure 14: timing-typeclass-reification-let-in-PHOAS



rewrite-strat(bottomup-bot

 $7.45\cdot 10^{-6}\cdot x^2 - 2.12\cdot 10^{-4}\cdot x^2 - 2.12\cdot 10^{-4}\cdot x^2 + 2.12\cdot 1$ 

 $1.62 \cdot 10^{-10} \cdot x^2 + 4.33 \cdot 10^{-6} \cdot$ 

 $1.09 \cdot 10^{-10} \cdot x^2 + 4.6 \cdot 10^{-6} \cdot x^2$ 

 $1.07 \cdot 10^{-10} \cdot x^2 + 3.29 \cdot 10^{-6} \cdot$ 

 $2.32\cdot 10^{-10}\cdot x^2 + 3.93\cdot 10^{-6}\cdot \\$ 

 $9.82 \cdot 10^{-7} \cdot x^2 + 3.44 \cdot 10^{-4} \cdot x^2$ 

 $-7.72 \cdot 10^{-3} \cdot x^3 + 0.25 \cdot x^2 -$ 

 $7 \cdot 10^{-3} \exp{(0.45 \cdot (0.45 \cdot (0.45$ 

 $7.5\cdot 10^{-3}\exp\left(0.45\cdot \left(0.45\cdot \left(0.45\cdot$ 

cps+vm-compute-

cps+native-compute

cps+cbv-real

cps+lazy-real

cps+simpl-real

setoid-rewrite-re

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

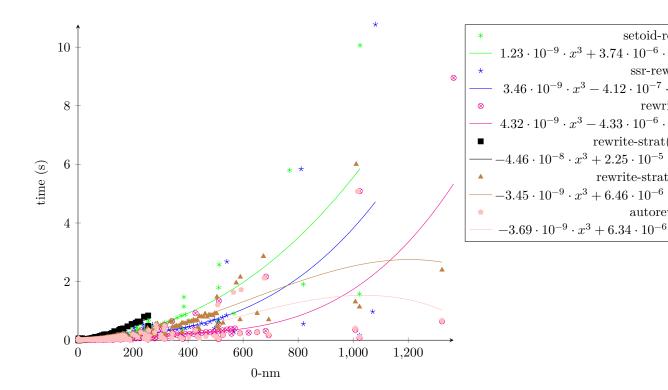
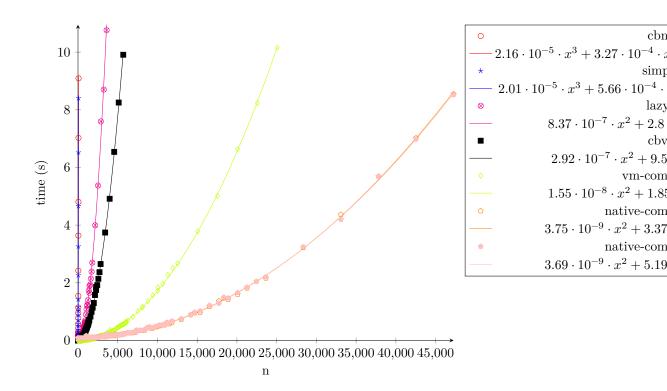


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



cbn

simp

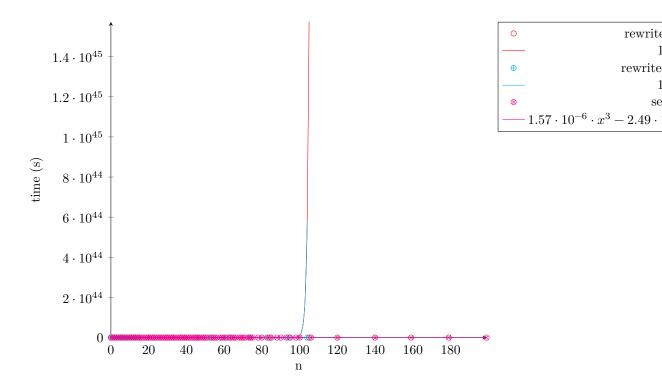
lazy

vm-com

native-com

native-com

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



rewrite

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