

Figure 1: timing-pattern

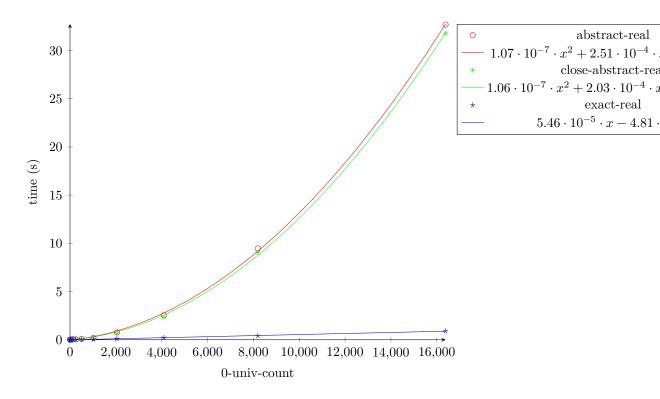
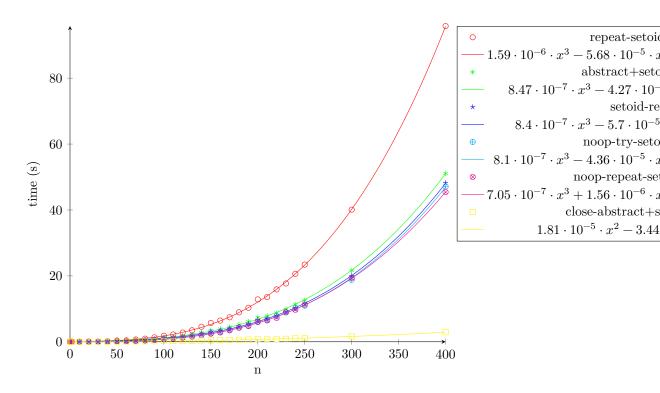


Figure 2: timing-n-polymorphic-universes param-1-n $\,0\,$



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

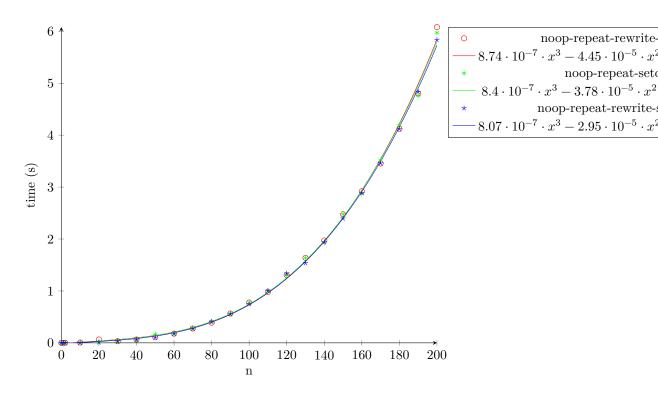
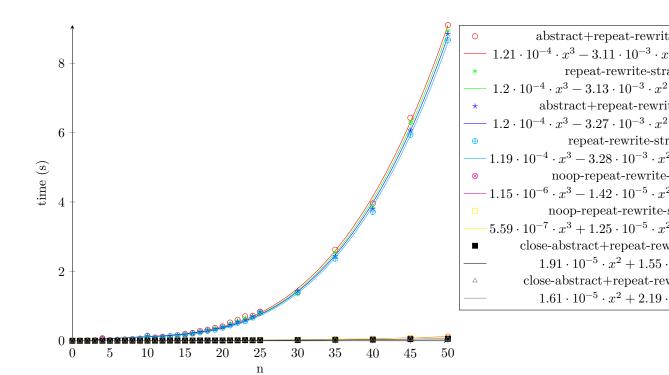


Figure 4: timing-repeat-setoid-rewrite-under-binders-noop



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

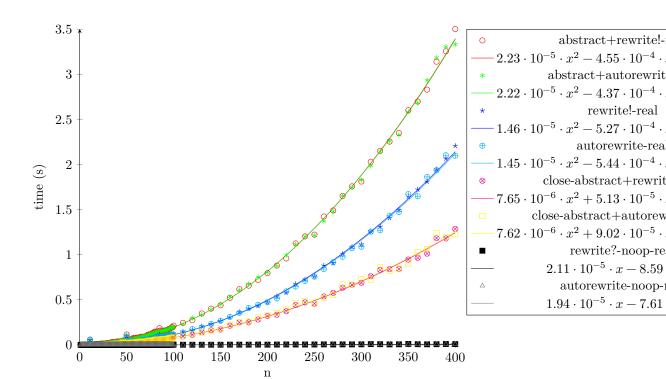


Figure 6: timing-rewrite-repeated-app-autorewrite

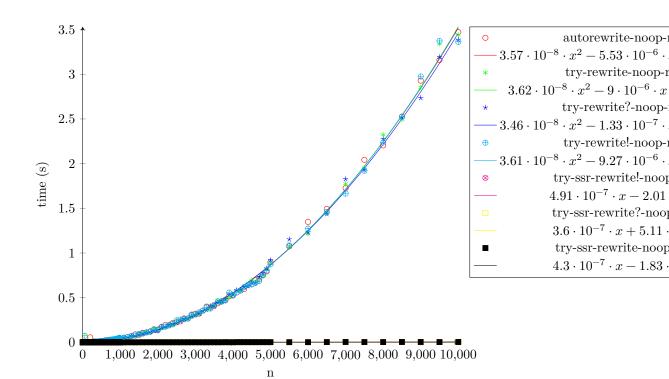
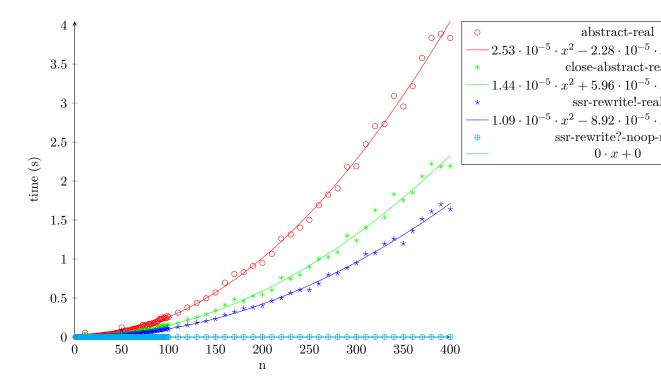
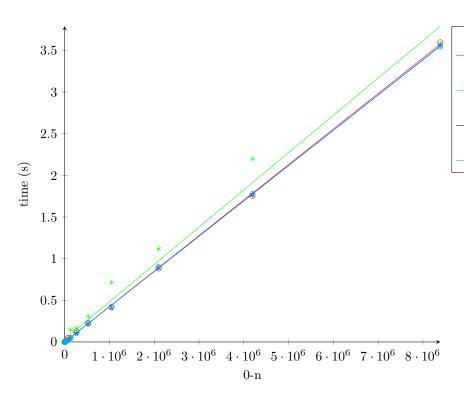


Figure 7: timing-rewrite-repeated-app-autorewrite-noop



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



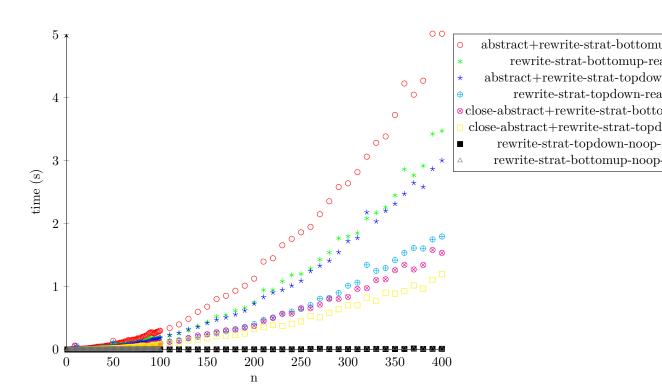
try-ssr-rewrite!-noop-real

 $4.26 \cdot 10^{-7} \cdot x - 1.76 \cdot 10^{-3}$ try-ssr-rewrite!-cold-noop-rea $4.48 \cdot 10^{-7} \cdot x + 3.48 \cdot 10^{-2}$

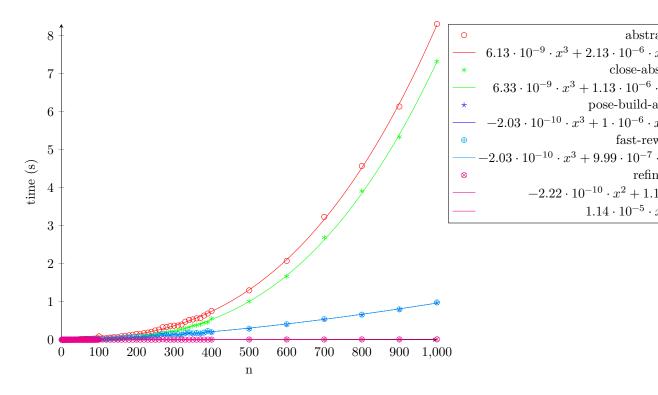
try-ssr-rewrite?-noop-real $4.24\cdot 10^{-7}\cdot x - 2.14\cdot 10^{-3}$

try-ssr-rewrite-noop-real $4.23\cdot 10^{-7}\cdot x - 1.19\cdot 10^{-3}$

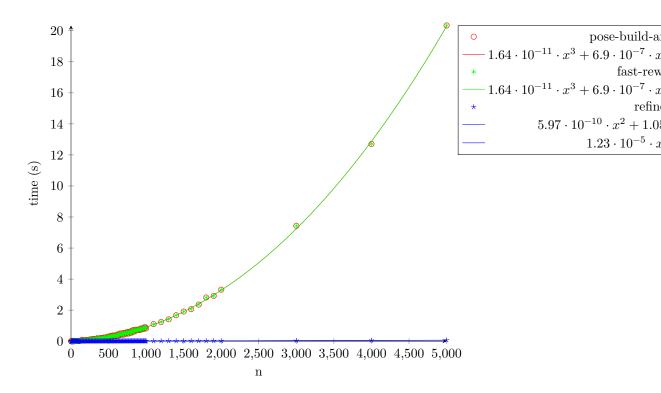
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn $\,1\,$



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



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



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

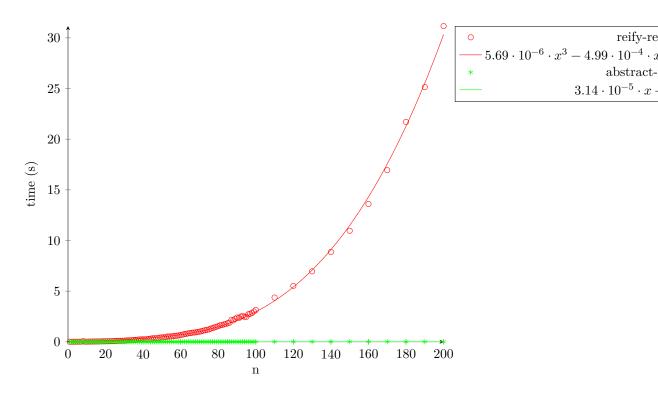
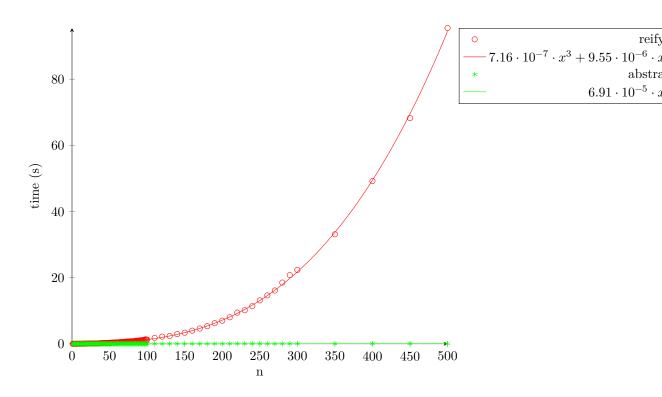


Figure 13: timing-typeclass-reification-let-in-HOAS



 ${\bf Figure~14:~timing-type class-reification-let-in-PHOAS}$

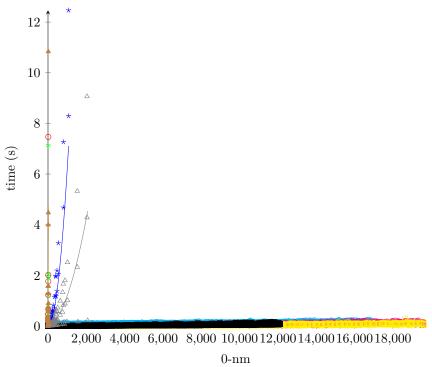


Figure 15: timing-rewrite-lift-lets-map param-1-n 1, param-2-m 1

```
rewrite-strat(bottomup-bot
                                                                                                                  3.75 \cdot 10^{-3} exp (0.47 \cdot (
                                                 rewrite-strat(topdown-bot
                                                                                                                     4.08 \cdot 10^{-3} exp (0.47 \cdot (
                                                                                                                                                                                                                                  cps+cbn-real
                           6.15 \cdot 10^{-6} \cdot x^2 - 2.23 \cdot 10^{-5}
                                                                                                                                                cps+native-compute
5.12 \cdot 10^{-11} \cdot x^2 + 5.74 \cdot 10^{-6} \cdot 
                                                                                                                                                                                                                                cps+lazy-real
                             2 \cdot 10^{-10} \cdot x^2 + 4.1 \cdot 10^{-6} \cdot x
                                                                                                                                                                                                                                     _{\rm cps+cbv\text{-}real}
            7.71 \cdot 10^{-11} \cdot x^2 + 3.6 \cdot 10^{-6} \cdot x^
                                                                                                                                                                    cps+vm-compute-
       2.06 \cdot 10^{-10} \cdot x^2 + 4.73 \cdot 10^{-6}
                                                                                                                                                                                                                    cps+simpl-real
       9.24 \cdot 10^{-7} \cdot x^2 + 2.84 \cdot 10^{-4} \cdot x^2
                                                                                                                                                                                                setoid-rewrite-re
                 -6.03 \cdot 10^{-3} \cdot x^3 + 0.19 \cdot x^2 -
```

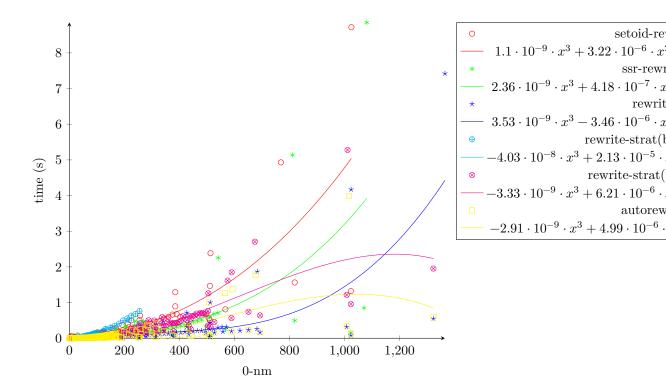
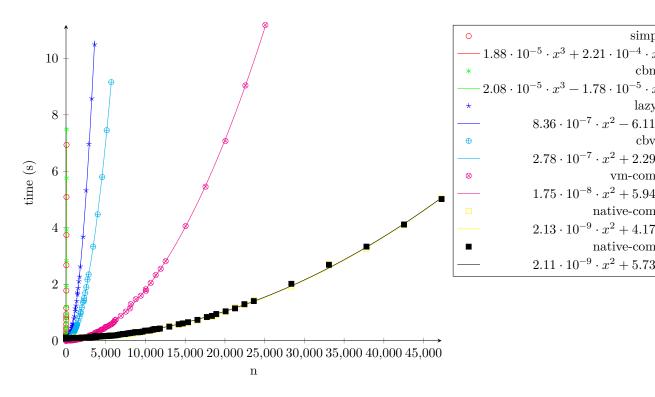


Figure 16: timing-rewrite-plus-0-tree param-1-n 0, param-2-m 1, param-3-input-size 5, param-4-output-size 3, param-5-num-rewrites 1



simp

lazy

vm-com

native-com

native-com

 $8.36 \cdot 10^{-7} \cdot x^2 - 6.11$

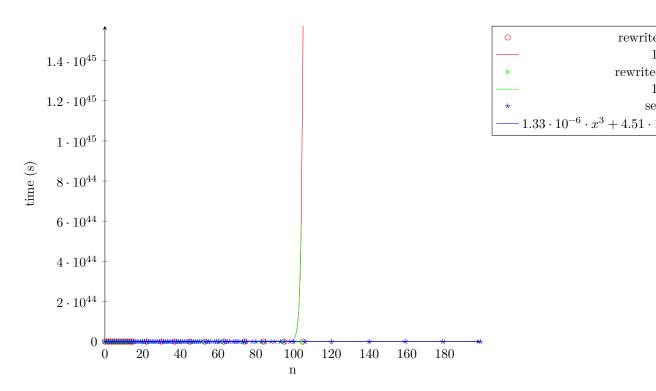
 $2.78 \cdot 10^{-7} \cdot x^2 + 2.29$

 $1.75 \cdot 10^{-8} \cdot x^2 + 5.94$

 $2.13 \cdot 10^{-9} \cdot x^2 + 4.17$

 $2.11 \cdot 10^{-9} \cdot x^2 + 5.73$

Figure 17: timing-sieve-of-eratosthenes



rewrite

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

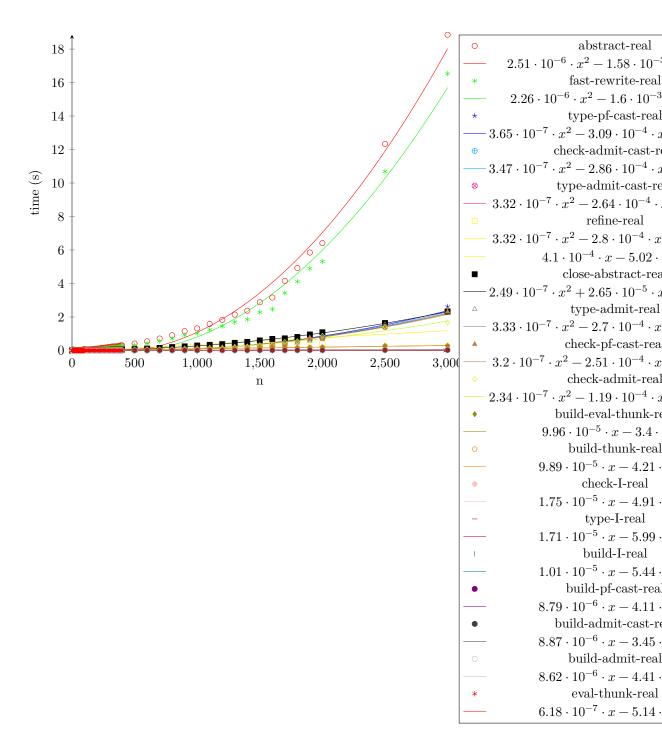


Figure 19: timing-rewrite-repeated-app-fast-rewrite-ltac2