time (s)

0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

n

○ pattern-user
— $3.26 \cdot 10^{-5} \cdot x - 4.22 \cdot 10^{-3}$
∗ pattern-real
— $3.26 \cdot 10^{-5} \cdot x - 4.13 \cdot 10^{-3}$
∗ pattern-sys

Figure 1: timing-pattern

1

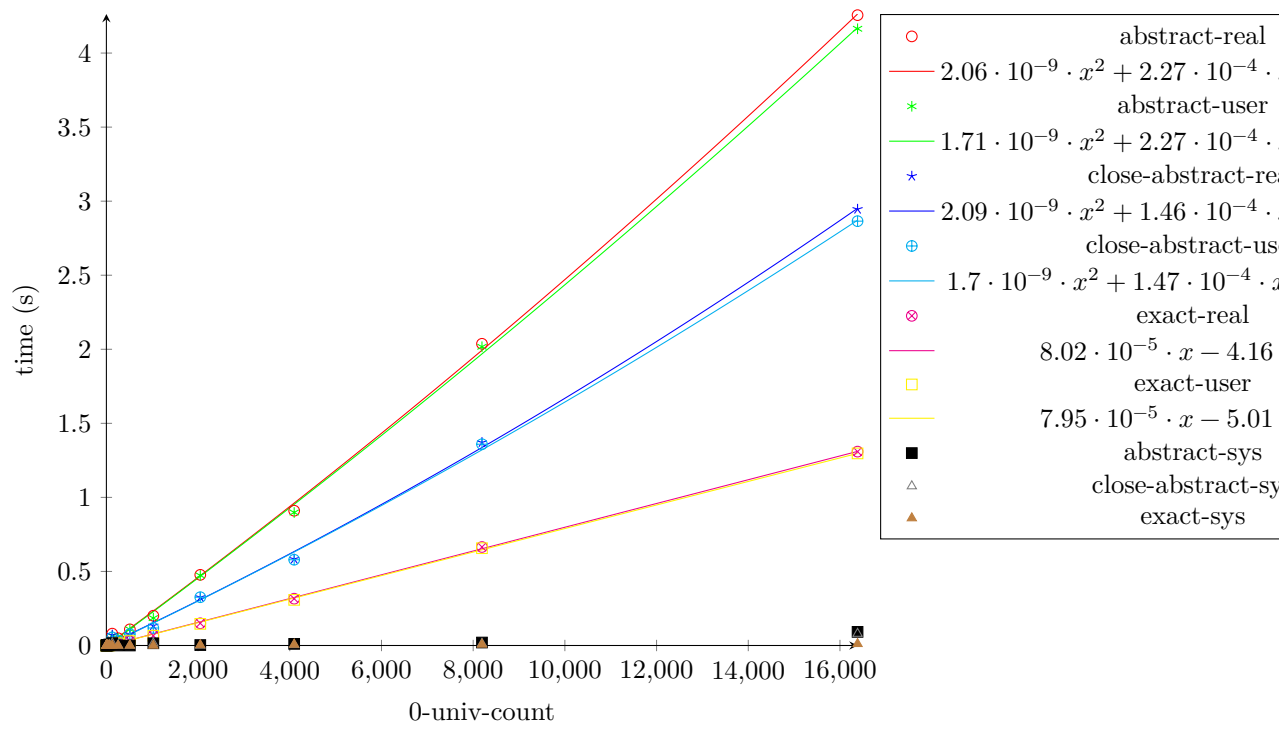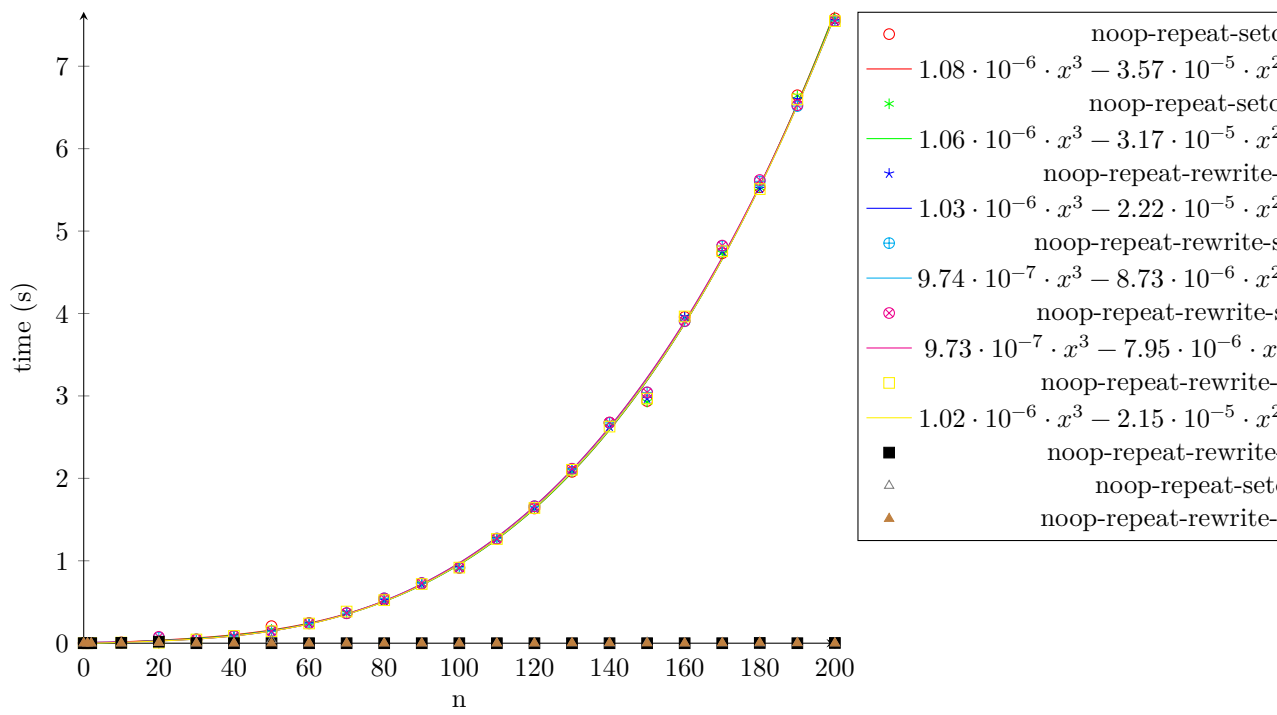Figure 2: timing-n-polymorphic-universes param-1-n 0
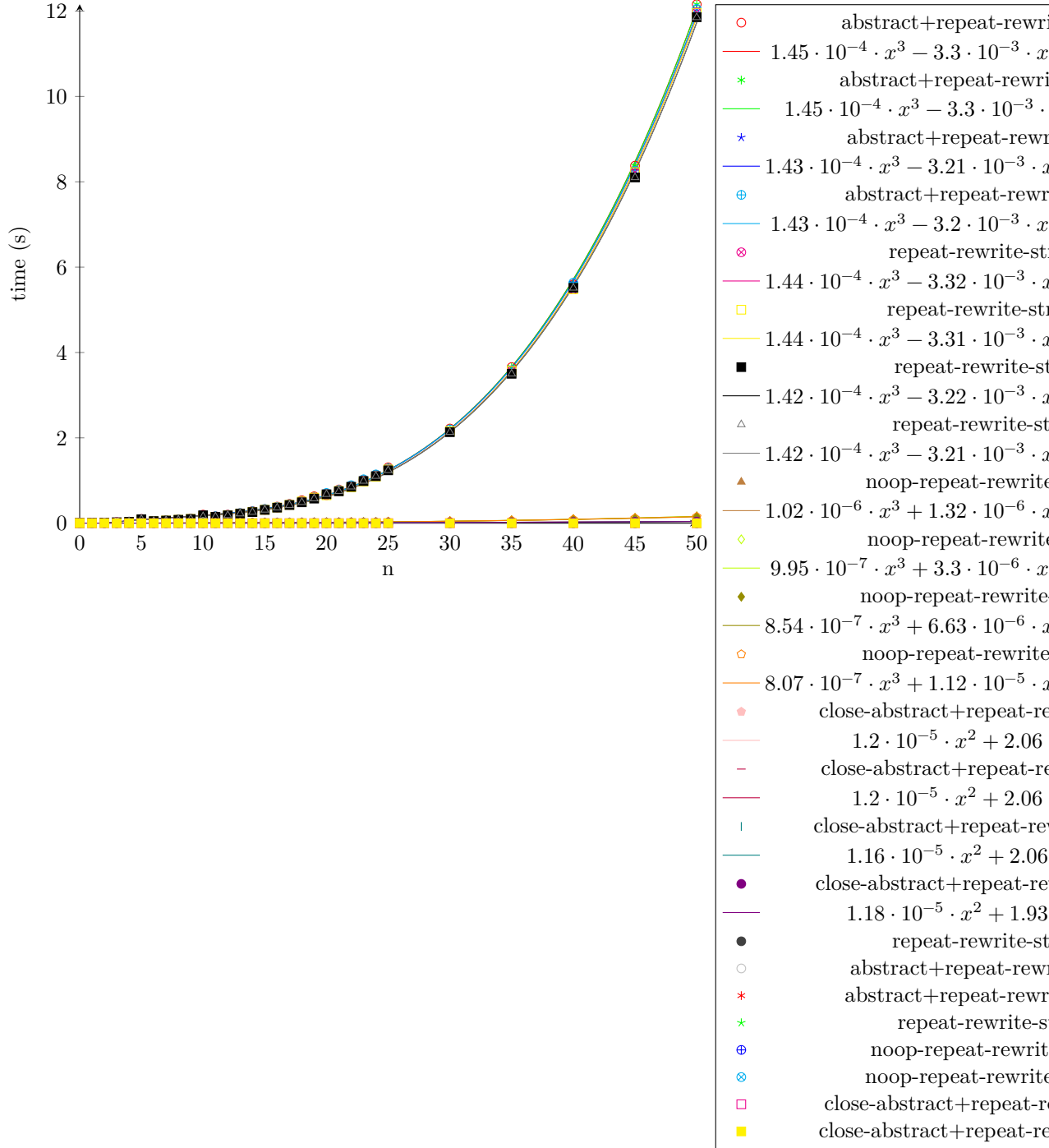
Figure 3: timing-repeat-setoid-rewrite-under-binders
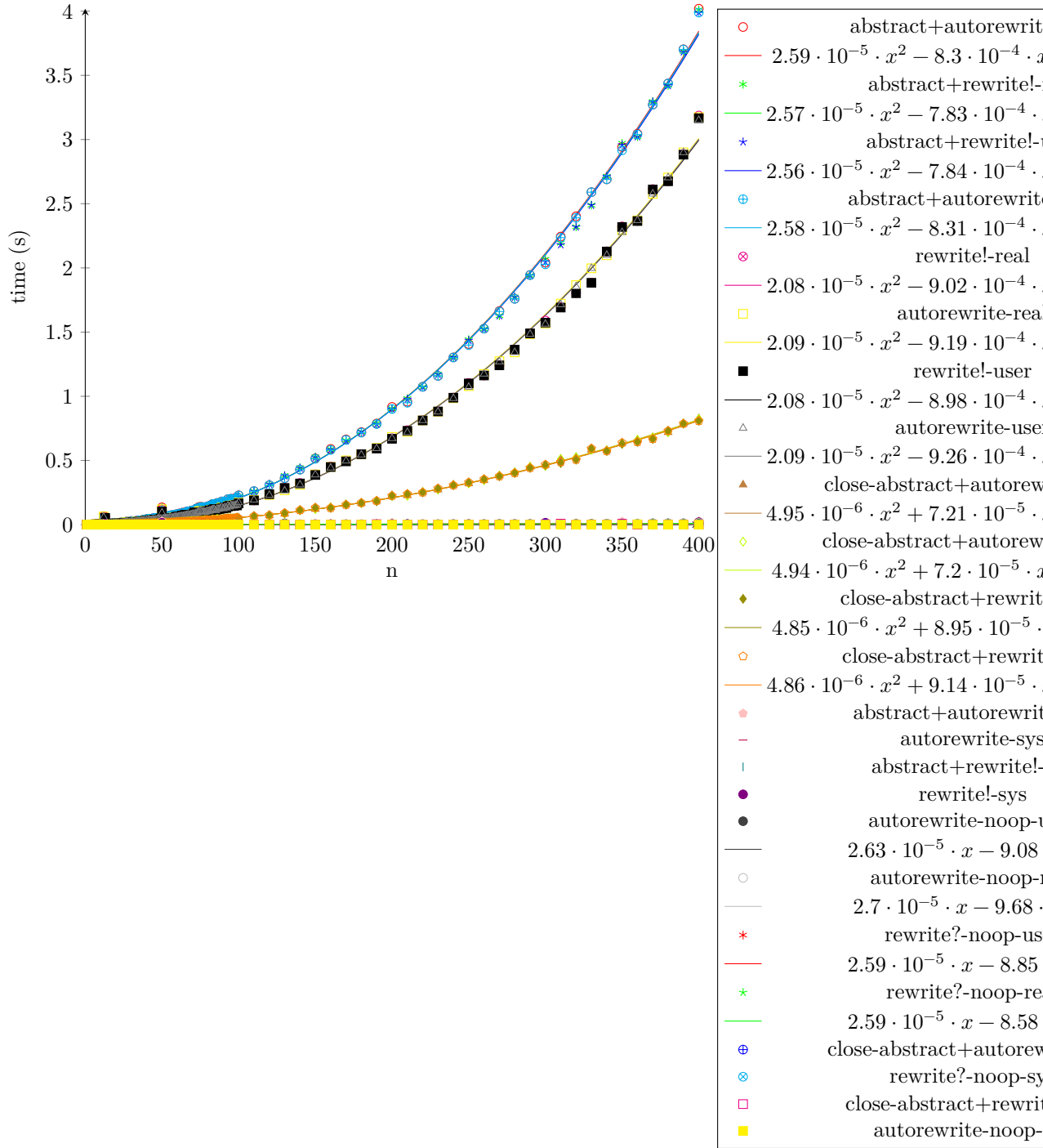
Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

4

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

The plot legend (partially cut off) contains:

- ○ abstract+repeat-rewri...
  $1.45 \cdot 10^{-4} \cdot x^3 - 3.3 \cdot 10^{-3} \cdot x$
- ∗ abstract+repeat-rewri...
  $1.45 \cdot 10^{-4} \cdot x^3 - 3.3 \cdot 10^{-3} \cdot$
- ∗ abstract+repeat-rewr...
  $1.43 \cdot 10^{-4} \cdot x^3 - 3.21 \cdot 10^{-3} \cdot x$
- ⊕ abstract+repeat-rewr...
  $1.43 \cdot 10^{-4} \cdot x^3 - 3.2 \cdot 10^{-3} \cdot x$
- ⊗ repeat-rewrite-st...
  $1.44 \cdot 10^{-4} \cdot x^3 - 3.32 \cdot 10^{-3} \cdot x$
- □ repeat-rewrite-st...
  $1.44 \cdot 10^{-4} \cdot x^3 - 3.31 \cdot 10^{-3} \cdot x$
- ■ repeat-rewrite-st...
  $1.42 \cdot 10^{-4} \cdot x^3 - 3.22 \cdot 10^{-3} \cdot x$
- △ repeat-rewrite-st...
  $1.42 \cdot 10^{-4} \cdot x^3 - 3.21 \cdot 10^{-3} \cdot x$
- ▲ noop-repeat-rewrite...
  $1.02 \cdot 10^{-6} \cdot x^3 + 1.32 \cdot 10^{-6} \cdot x$
- ◇ noop-repeat-rewrite...
  $9.95 \cdot 10^{-7} \cdot x^3 + 3.3 \cdot 10^{-6} \cdot x$
- ◆ noop-repeat-rewrite...
  $8.54 \cdot 10^{-7} \cdot x^3 + 6.63 \cdot 10^{-6} \cdot x$
- ⬠ noop-repeat-rewrite...
  $8.07 \cdot 10^{-7} \cdot x^3 + 1.12 \cdot 10^{-5} \cdot x$
- ⬠ close-abstract+repeat-re...
  $1.2 \cdot 10^{-5} \cdot x^2 + 2.06$
- − close-abstract+repeat-re...
  $1.2 \cdot 10^{-5} \cdot x^2 + 2.06$
- | close-abstract+repeat-re...
  $1.16 \cdot 10^{-5} \cdot x^2 + 2.06$
- ● close-abstract+repeat-re...
  $1.18 \cdot 10^{-5} \cdot x^2 + 1.93$
- ● repeat-rewrite-st...
- ○ abstract+repeat-rewr...
- ∗ abstract+repeat-rewr...
- ∗ repeat-rewrite-st...
- ⊕ noop-repeat-rewrit...
- ⊗ noop-repeat-rewrite...
- □ close-abstract+repeat-re...
- ■ close-abstract+repeat-re...

The legend contains the following entries:

- abstract+autorewrit
- $2.59 \cdot 10^{-5} \cdot x^2 - 8.3 \cdot 10^{-4} \cdot x$
- abstract+rewrite!-
- $2.57 \cdot 10^{-5} \cdot x^2 - 7.83 \cdot 10^{-4} \cdot x$
- abstract+rewrite!-u
- $2.56 \cdot 10^{-5} \cdot x^2 - 7.84 \cdot 10^{-4} \cdot x$
- abstract+autorewrit
- $2.58 \cdot 10^{-5} \cdot x^2 - 8.31 \cdot 10^{-4} \cdot x$
- rewrite!-real
- $2.08 \cdot 10^{-5} \cdot x^2 - 9.02 \cdot 10^{-4} \cdot x$
- autorewrite-real
- $2.09 \cdot 10^{-5} \cdot x^2 - 9.19 \cdot 10^{-4} \cdot x$
- rewrite!-user
- $2.08 \cdot 10^{-5} \cdot x^2 - 8.98 \cdot 10^{-4} \cdot x$
- autorewrite-user
- $2.09 \cdot 10^{-5} \cdot x^2 - 9.26 \cdot 10^{-4} \cdot x$
- close-abstract+autorew
- $4.95 \cdot 10^{-6} \cdot x^2 + 7.21 \cdot 10^{-5} \cdot x$
- close-abstract+autorew
- $4.94 \cdot 10^{-6} \cdot x^2 + 7.2 \cdot 10^{-5} \cdot x$
- close-abstract+rewrit
- $4.85 \cdot 10^{-6} \cdot x^2 + 8.95 \cdot 10^{-5} \cdot x$
- close-abstract+rewrit
- $4.86 \cdot 10^{-6} \cdot x^2 + 9.14 \cdot 10^{-5} \cdot x$
- abstract+autorewrit
- autorewrite-sys
- abstract+rewrite!-
- rewrite!-sys
- autorewrite-noop-u
- $2.63 \cdot 10^{-5} \cdot x - 9.08$
- autorewrite-noop-r
- $2.7 \cdot 10^{-5} \cdot x - 9.68$
- rewrite?-noop-us
- $2.59 \cdot 10^{-5} \cdot x - 8.85$
- rewrite?-noop-re
- $2.59 \cdot 10^{-5} \cdot x - 8.58$
- close-abstract+autorew
- rewrite?-noop-sy
- close-abstract+rewrit
- autorewrite-noop-

Figure 6: timing-rewrite-repeated-app-autorewrite
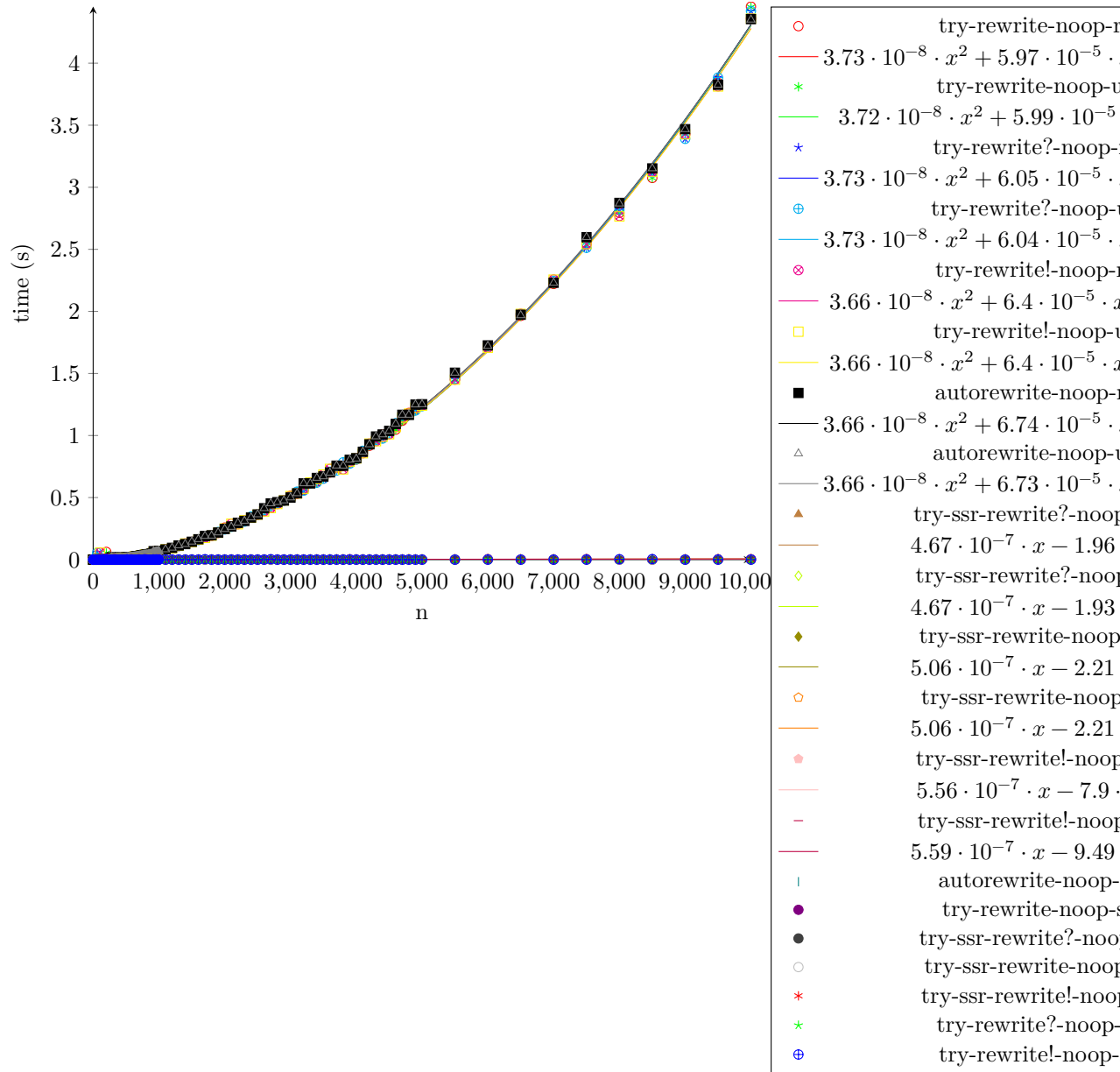
Figure 7: timing-rewrite-repeated-app-autorewrite-noop

7
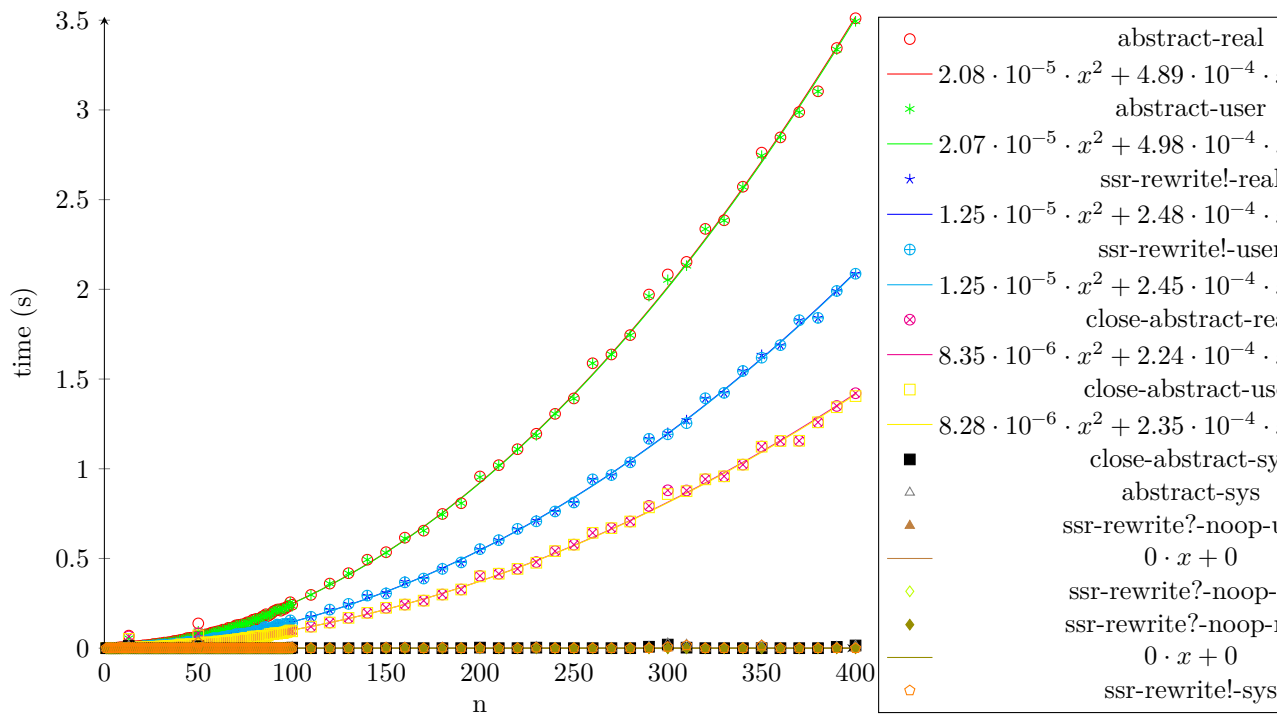
Figure 8: timing-rewrite-repeated-app-ssrrewrite

8
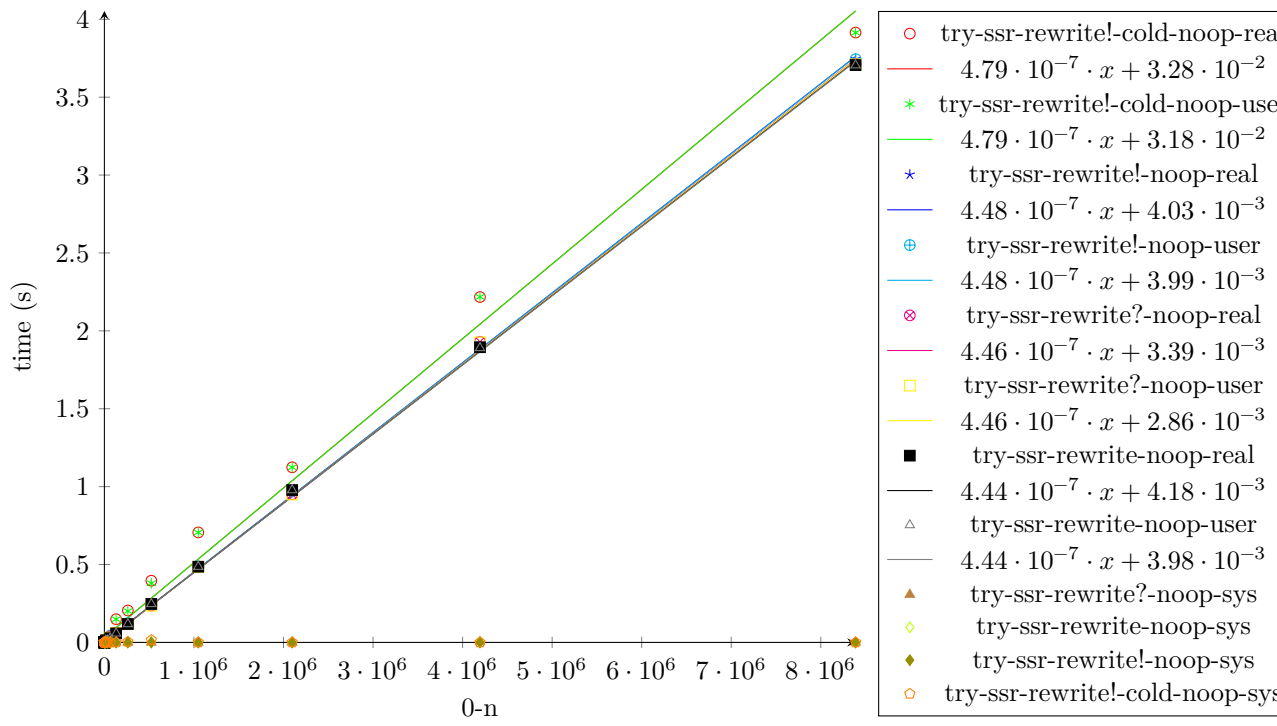
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn 1
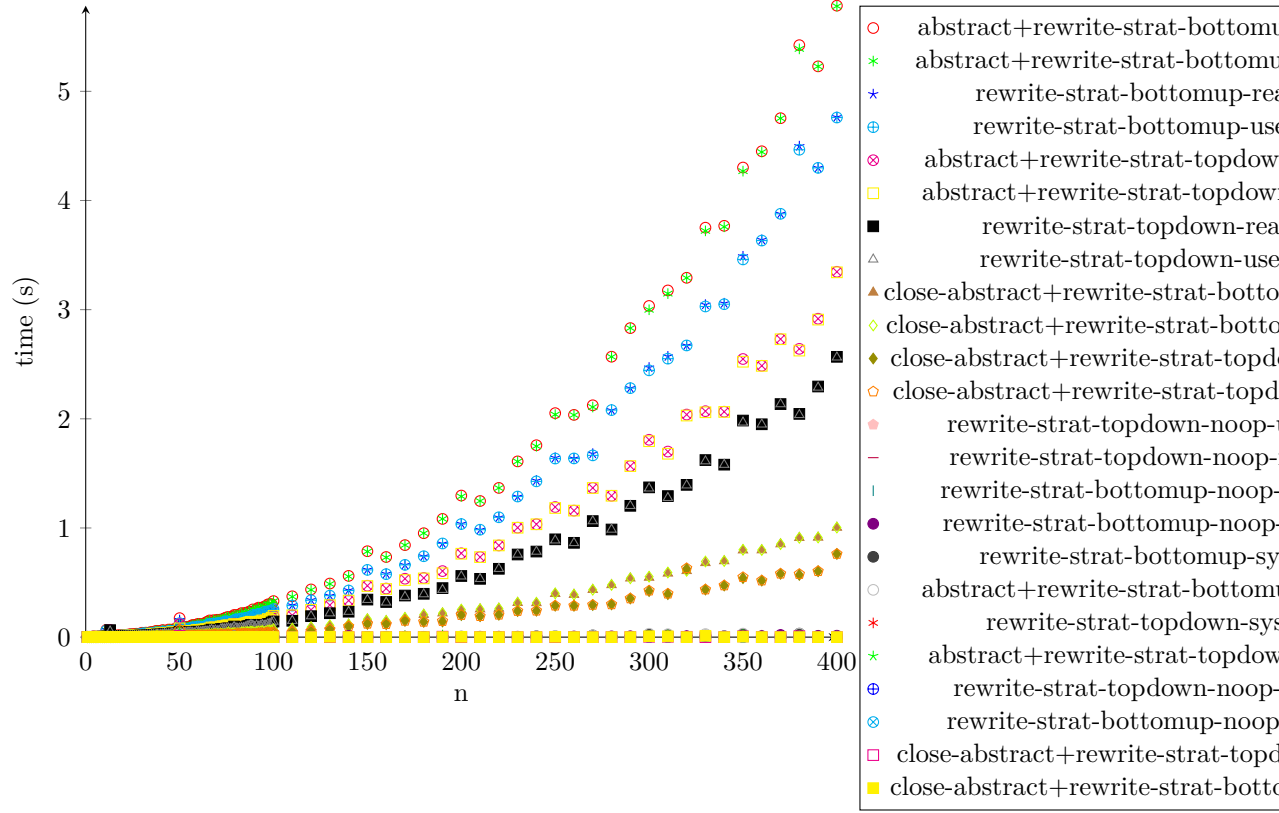
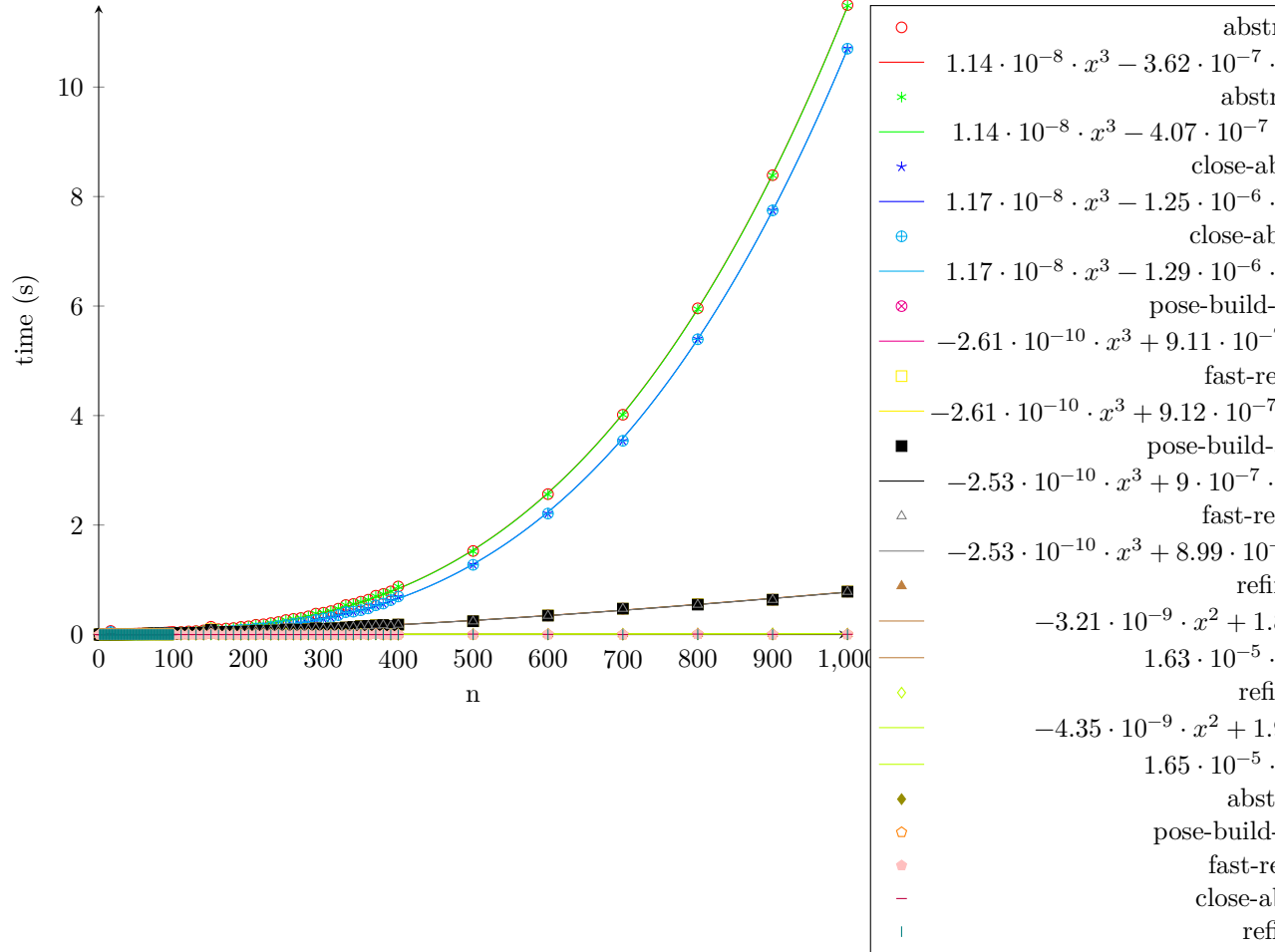Figure 10: timing-rewrite-repeated-app-rewrite-strat

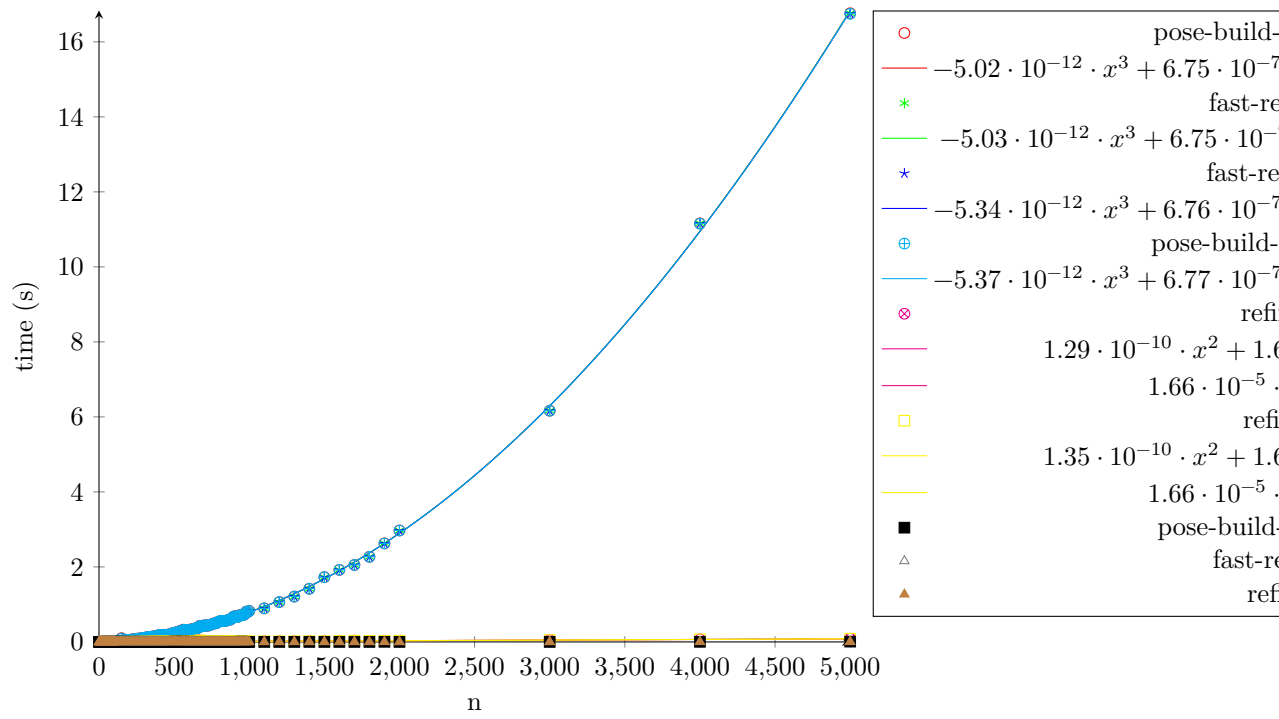Figure 11: timing-rewrite-repeated-app-fast-rewrite

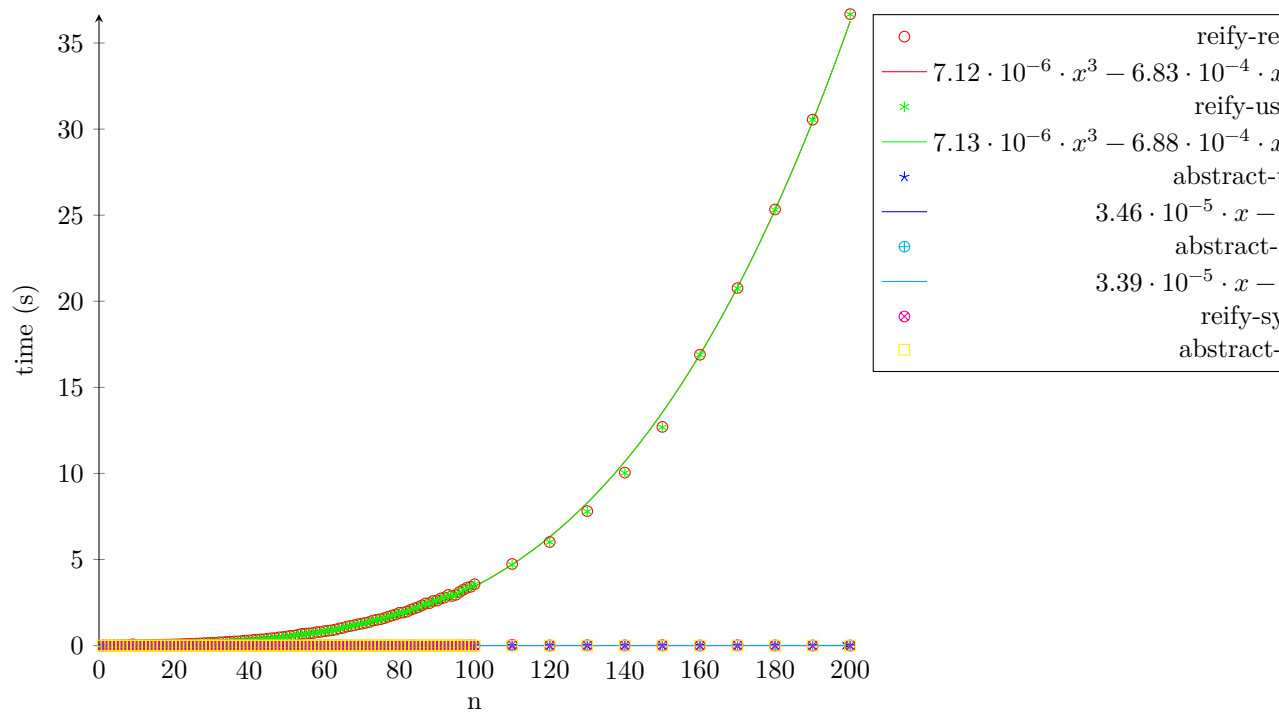Figure 12: timing-rewrite-repeated-app-fast-rewrite-no-abstract
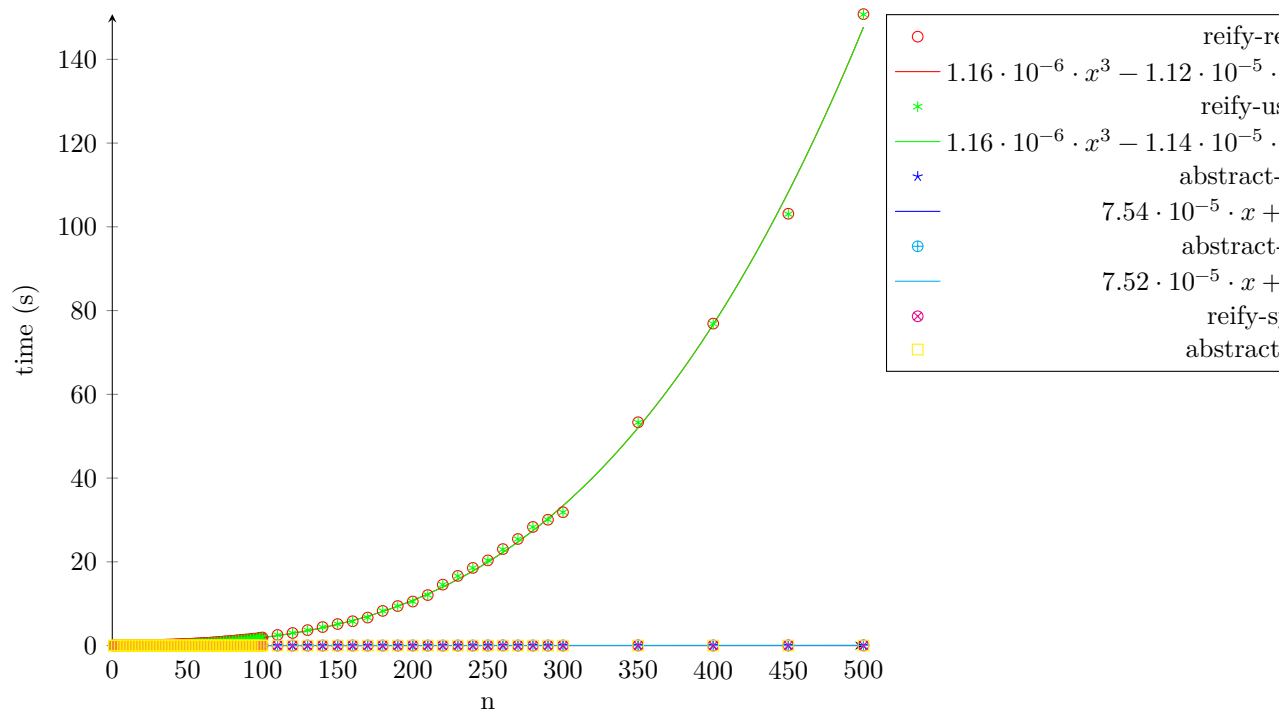
Figure 13: timing-typeclass-reification-let-in-HOAS

13

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