Figure 1: timing-pattern

1

abstract-real

$1.54 \cdot 10^{-9} \cdot x^2 + 1.86 \cdot 10^{-4} \cdot$

abstract-user

$1.39 \cdot 10^{-9} \cdot x^2 + 1.83 \cdot 10^{-4} \cdot$

close-abstract-rea

$1.52 \cdot 10^{-9} \cdot x^2 + 1.29 \cdot 10^{-4} \cdot$

close-abstract-us

$1.45 \cdot 10^{-9} \cdot x^2 + 1.27 \cdot 10^{-4} \cdot$

exact-real

$5.69 \cdot 10^{-5} \cdot x - 2.16$

exact-user

$5.52 \cdot 10^{-5} \cdot x - 2.75$

abstract-sys

close-abstract-sy

exact-sys

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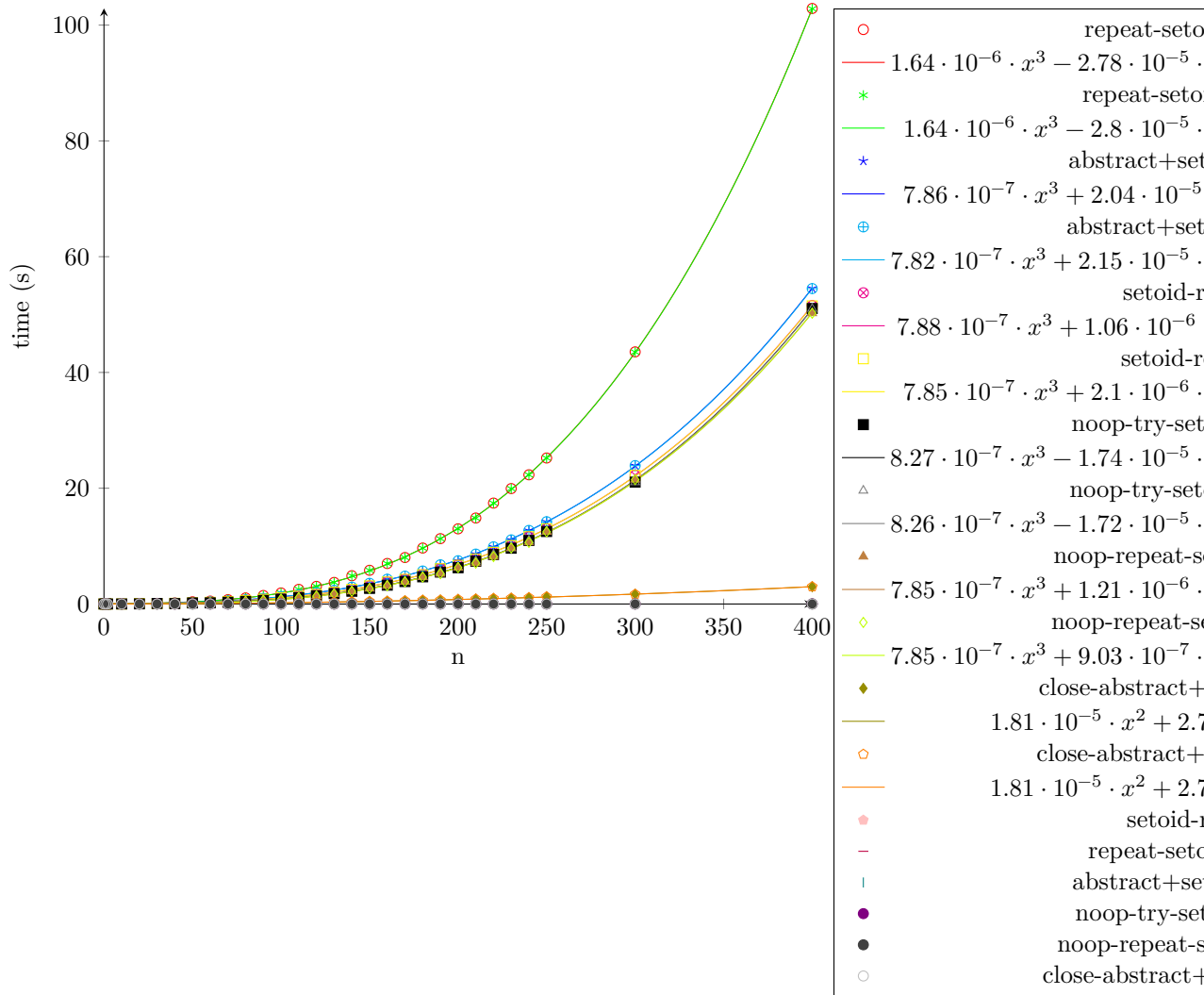
Figure 3: timing-repeat-setoid-rewrite-under-binders

The legend entries (partially cut off) read:

- repeat-seto...
- $1.64 \cdot 10^{-6} \cdot x^3 - 2.78 \cdot 10^{-5} \cdot \ldots$
- repeat-seto...
- $1.64 \cdot 10^{-6} \cdot x^3 - 2.8 \cdot 10^{-5} \cdot \ldots$
- abstract+set...
- $7.86 \cdot 10^{-7} \cdot x^3 + 2.04 \cdot 10^{-5} \ldots$
- abstract+set...
- $7.82 \cdot 10^{-7} \cdot x^3 + 2.15 \cdot 10^{-5} \cdot \ldots$
- setoid-r...
- $7.88 \cdot 10^{-7} \cdot x^3 + 1.06 \cdot 10^{-6} \ldots$
- setoid-r...
- $7.85 \cdot 10^{-7} \cdot x^3 + 2.1 \cdot 10^{-6} \cdot \ldots$
- noop-try-set...
- $8.27 \cdot 10^{-7} \cdot x^3 - 1.74 \cdot 10^{-5} \cdot \ldots$
- noop-try-set...
- $8.26 \cdot 10^{-7} \cdot x^3 - 1.72 \cdot 10^{-5} \cdot \ldots$
- noop-repeat-s...
- $7.85 \cdot 10^{-7} \cdot x^3 + 1.21 \cdot 10^{-6} \cdot \ldots$
- noop-repeat-s...
- $7.85 \cdot 10^{-7} \cdot x^3 + 9.03 \cdot 10^{-7} \cdot \ldots$
- close-abstract+...
- $1.81 \cdot 10^{-5} \cdot x^2 + 2.7 \ldots$
- close-abstract+...
- $1.81 \cdot 10^{-5} \cdot x^2 + 2.7 \ldots$
- setoid-r...
- repeat-seto...
- abstract+se...
- noop-try-set...
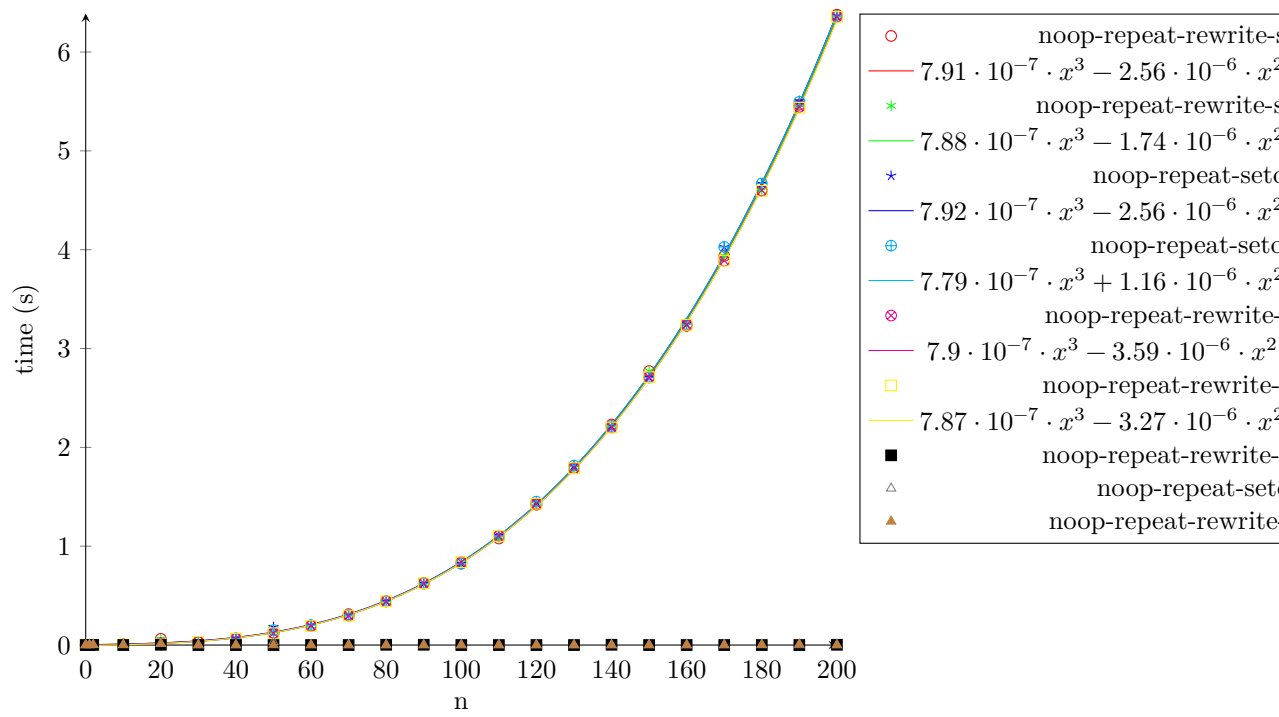- noop-repeat-s...
- close-abstract+...

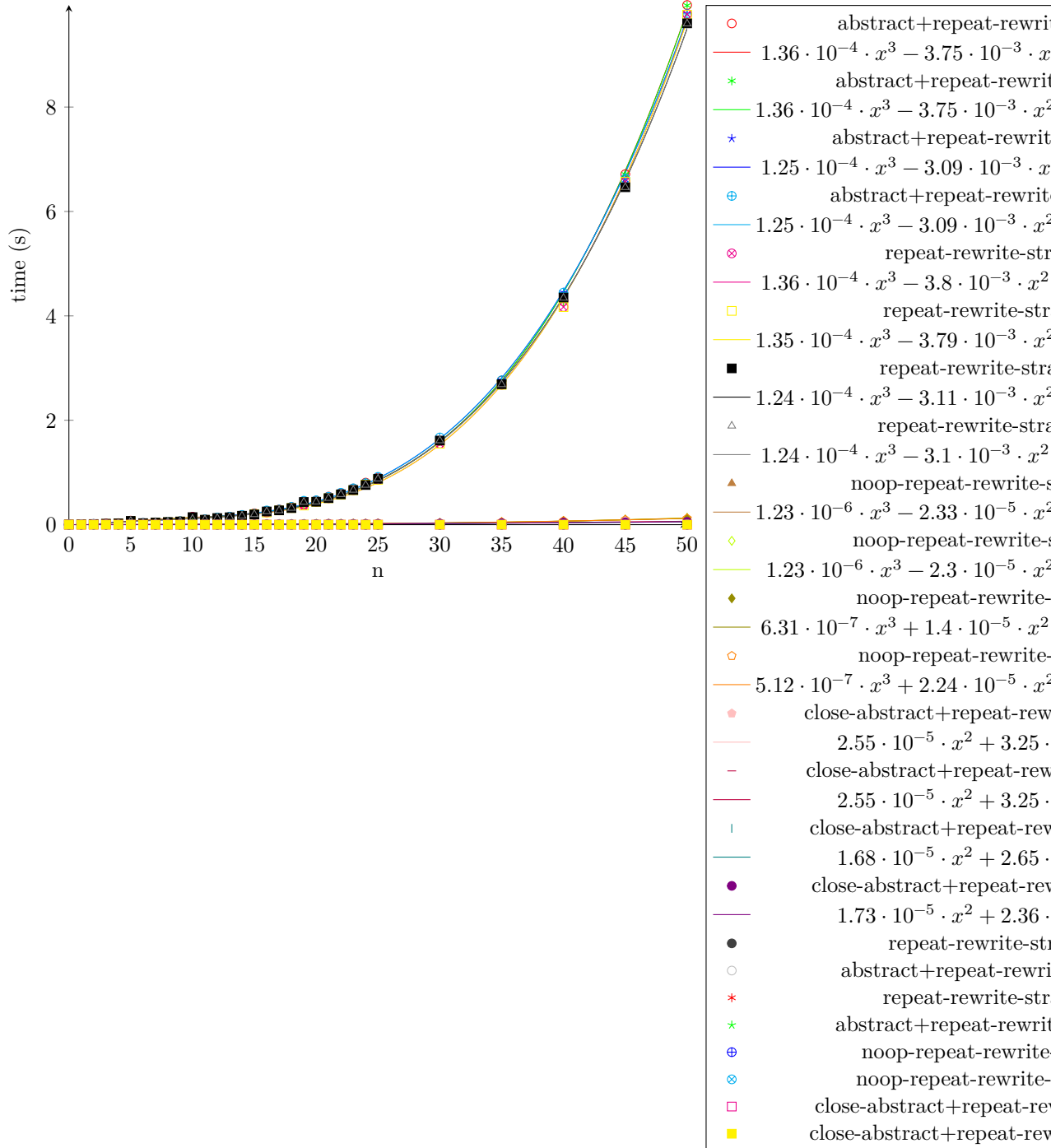Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

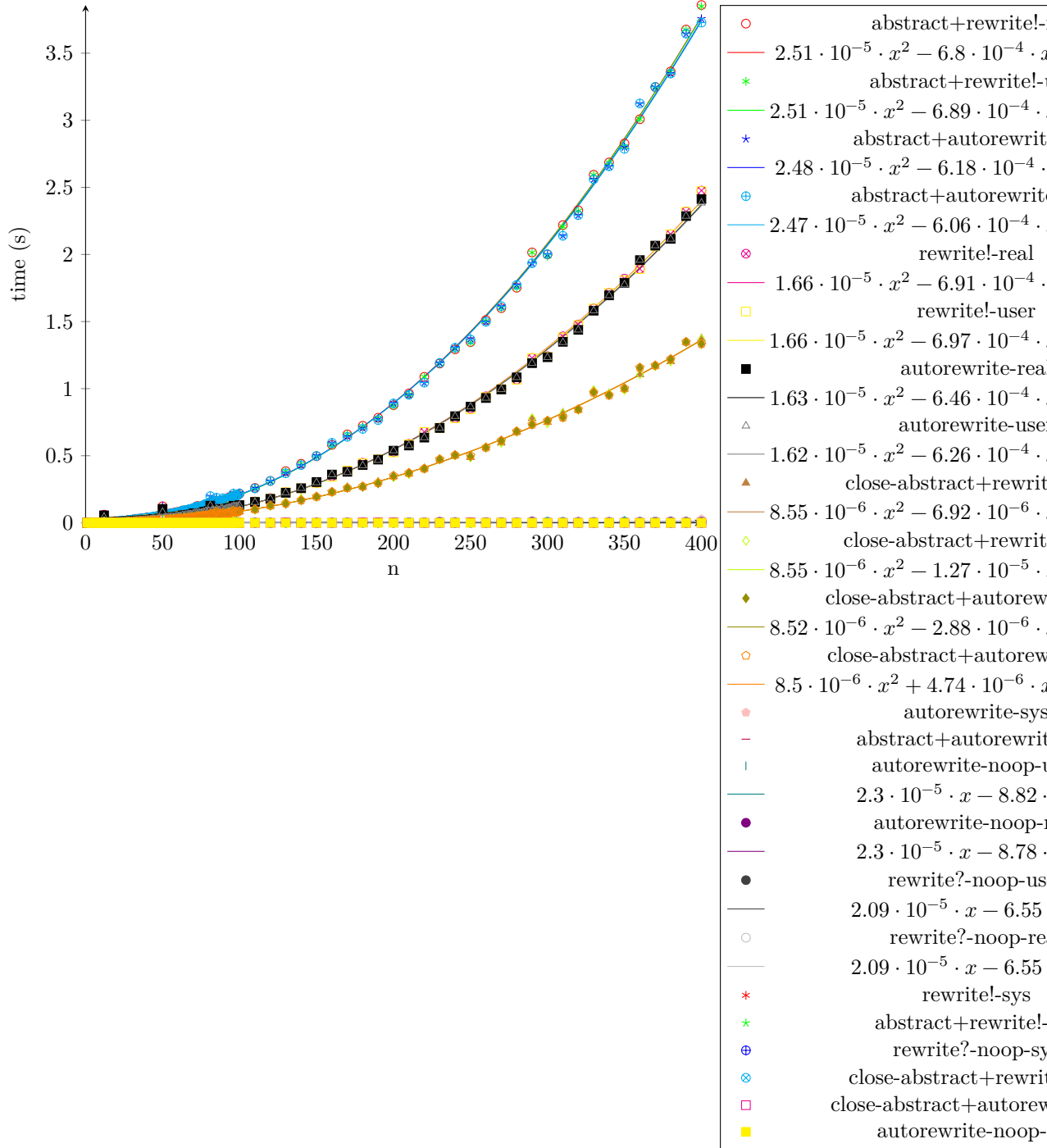4

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

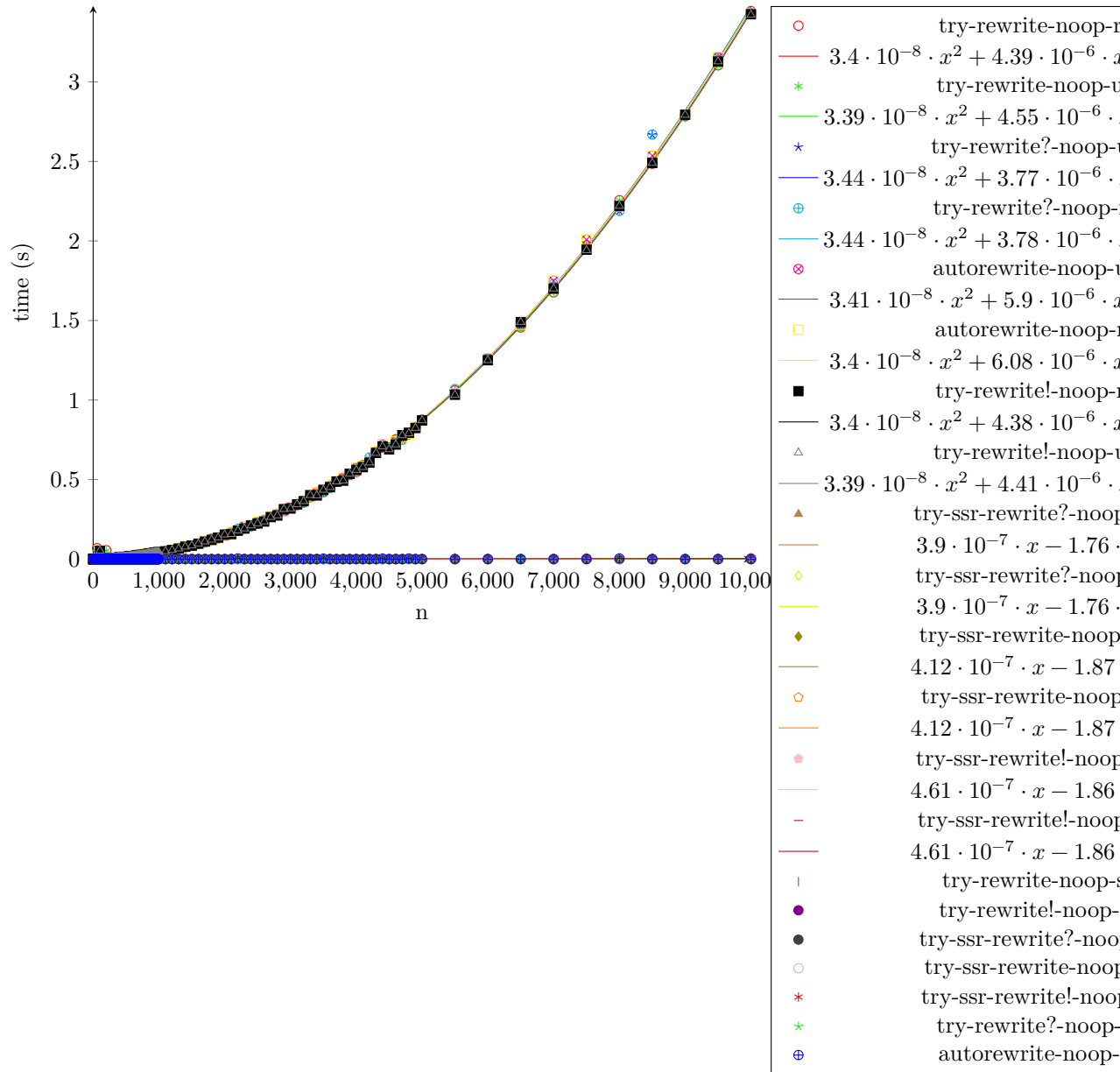Figure 6: timing-rewrite-repeated-app-autorewrite

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

7
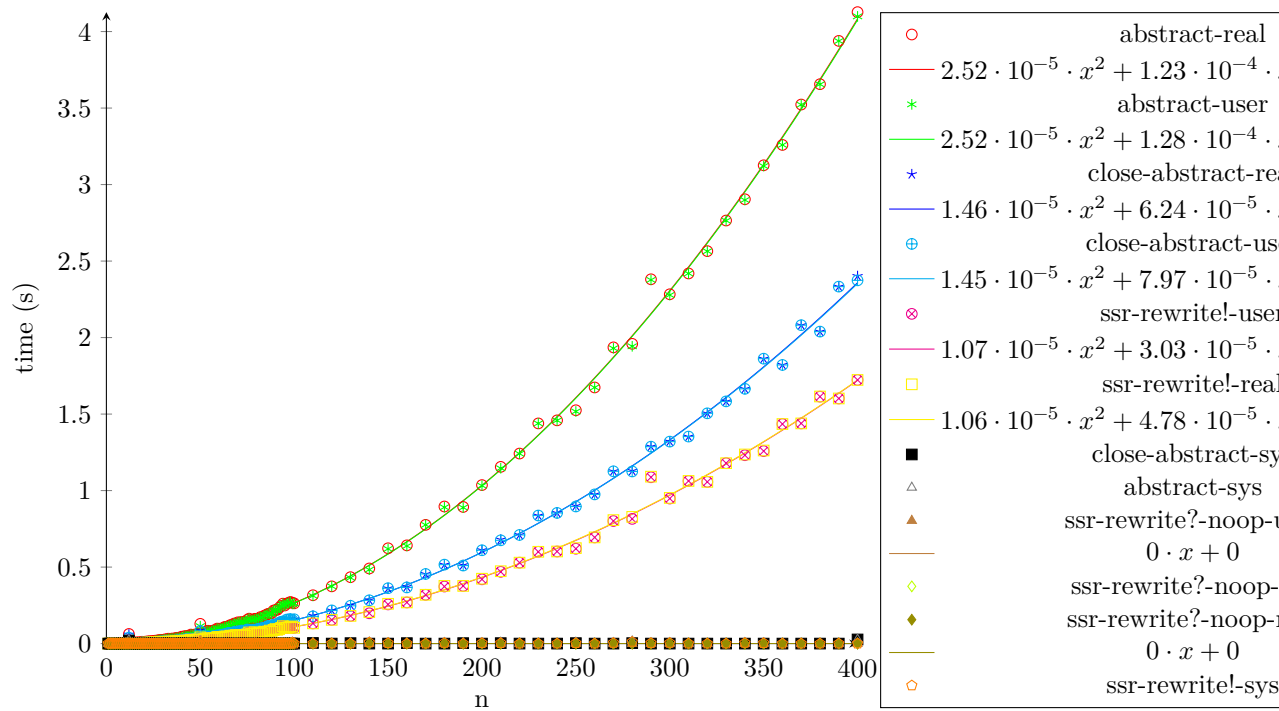
Figure 8: timing-rewrite-repeated-app-ssrrewrite
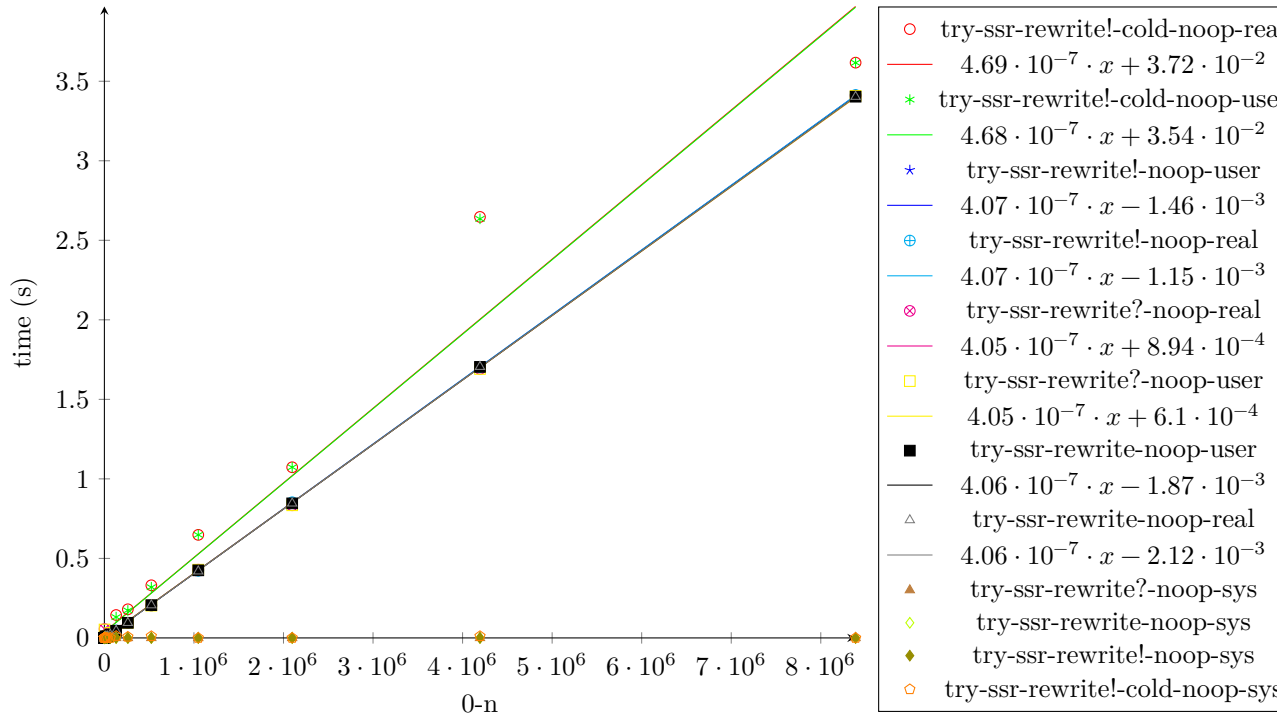
Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn 1

The plot legend entries:

- try-ssr-rewrite!-cold-noop-real
- $4.69 \cdot 10^{-7} \cdot x + 3.72 \cdot 10^{-2}$
- try-ssr-rewrite!-cold-noop-user
- $4.68 \cdot 10^{-7} \cdot x + 3.54 \cdot 10^{-2}$
- try-ssr-rewrite!-noop-user
- $4.07 \cdot 10^{-7} \cdot x - 1.46 \cdot 10^{-3}$
- try-ssr-rewrite!-noop-real
- $4.07 \cdot 10^{-7} \cdot x - 1.15 \cdot 10^{-3}$
- try-ssr-rewrite?-noop-real
- $4.05 \cdot 10^{-7} \cdot x + 8.94 \cdot 10^{-4}$
- try-ssr-rewrite?-noop-user
- $4.05 \cdot 10^{-7} \cdot x + 6.1 \cdot 10^{-4}$
- try-ssr-rewrite-noop-user
- $4.06 \cdot 10^{-7} \cdot x - 1.87 \cdot 10^{-3}$
- try-ssr-rewrite-noop-real
- $4.06 \cdot 10^{-7} \cdot x - 2.12 \cdot 10^{-3}$
- try-ssr-rewrite?-noop-sys
- try-ssr-rewrite-noop-sys
- try-ssr-rewrite!-noop-sys
- try-ssr-rewrite!-cold-noop-sys

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

time (s)

8

7

6

5

4

3

2

1

0

0   100   200   300   400   500   600   700   800   900   1,000

n

○ abstrac
— $8.42 \cdot 10^{-9} \cdot x^3 + 1.01 \cdot 10^{-7} \cdot x$
∗ abstrac
— $8.4 \cdot 10^{-9} \cdot x^3 + 9.74 \cdot 10^{-8} \cdot x^2$
⋆ close-abst
— $8.32 \cdot 10^{-9} \cdot x^3 - 2.42 \cdot 10^{-7} \cdot x$
⊕ close-abst
— $8.3 \cdot 10^{-9} \cdot x^3 - 2.4 \cdot 10^{-7} \cdot x^2$
⊗ pose-build-an
— $1.22 \cdot 10^{-10} \cdot x^3 + 3.1 \cdot 10^{-7} \cdot x$
□ fast-rewr
— $1.23 \cdot 10^{-10} \cdot x^3 + 3.09 \cdot 10^{-7} \cdot x$
■ pose-build-an
— $1.24 \cdot 10^{-10} \cdot x^3 + 3.03 \cdot 10^{-7} \cdot x$
△ fast-rewr
— $1.25 \cdot 10^{-10} \cdot x^3 + 3.03 \cdot 10^{-7} \cdot x$
▲ abstra
◇ refine
— $-1.07 \cdot 10^{-9} \cdot x^2 + 1.24$
— $1.16 \cdot 10^{-5} \cdot x$
◆ refine
— $-1.1 \cdot 10^{-9} \cdot x^2 + 1.24$
— $1.16 \cdot 10^{-5} \cdot x$
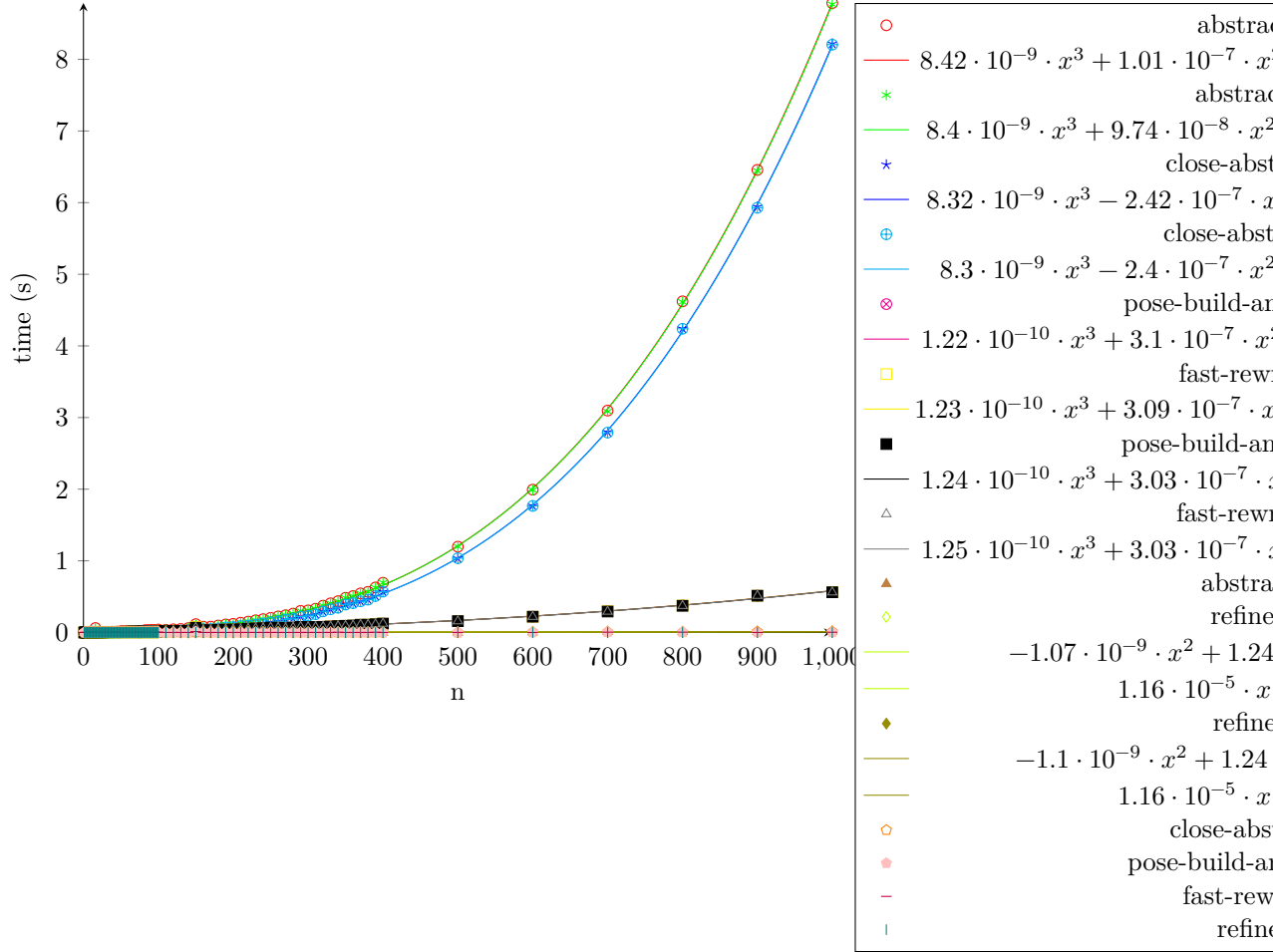⬠ close-abst
⬠ pose-build-an
— fast-rew
| refine

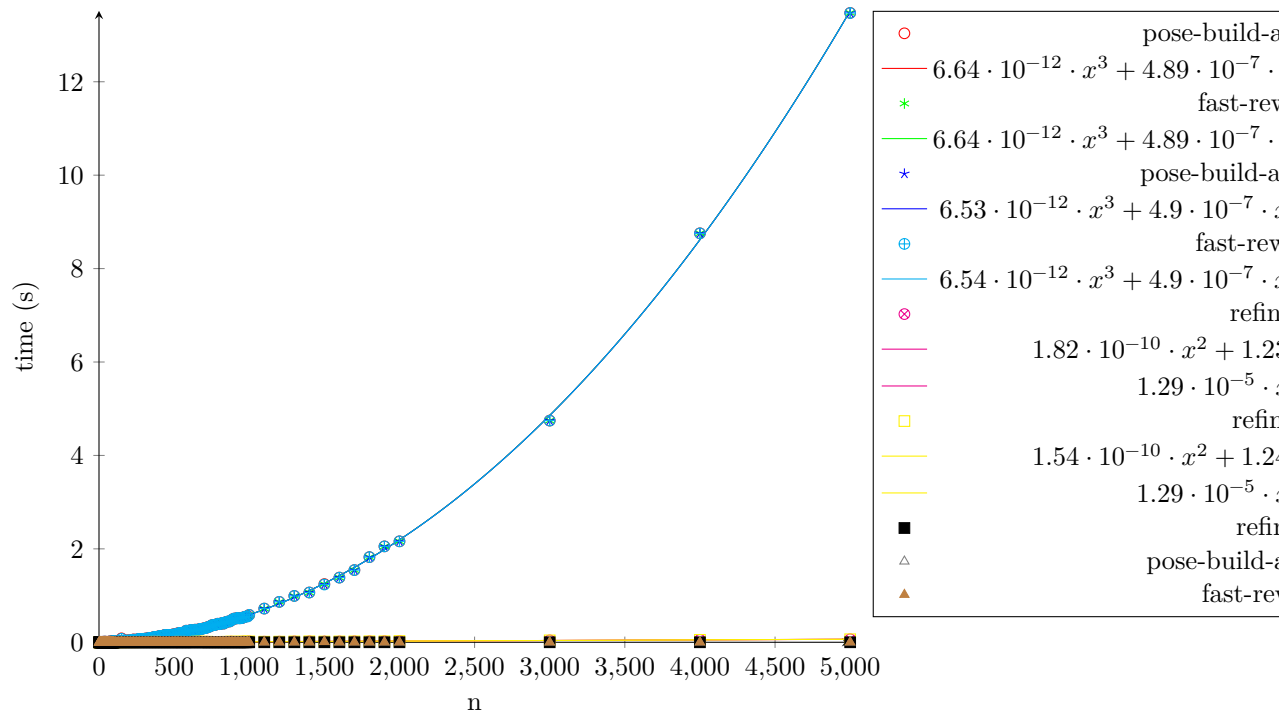Figure 11: timing-rewrite-repeated-app-fast-rewrite

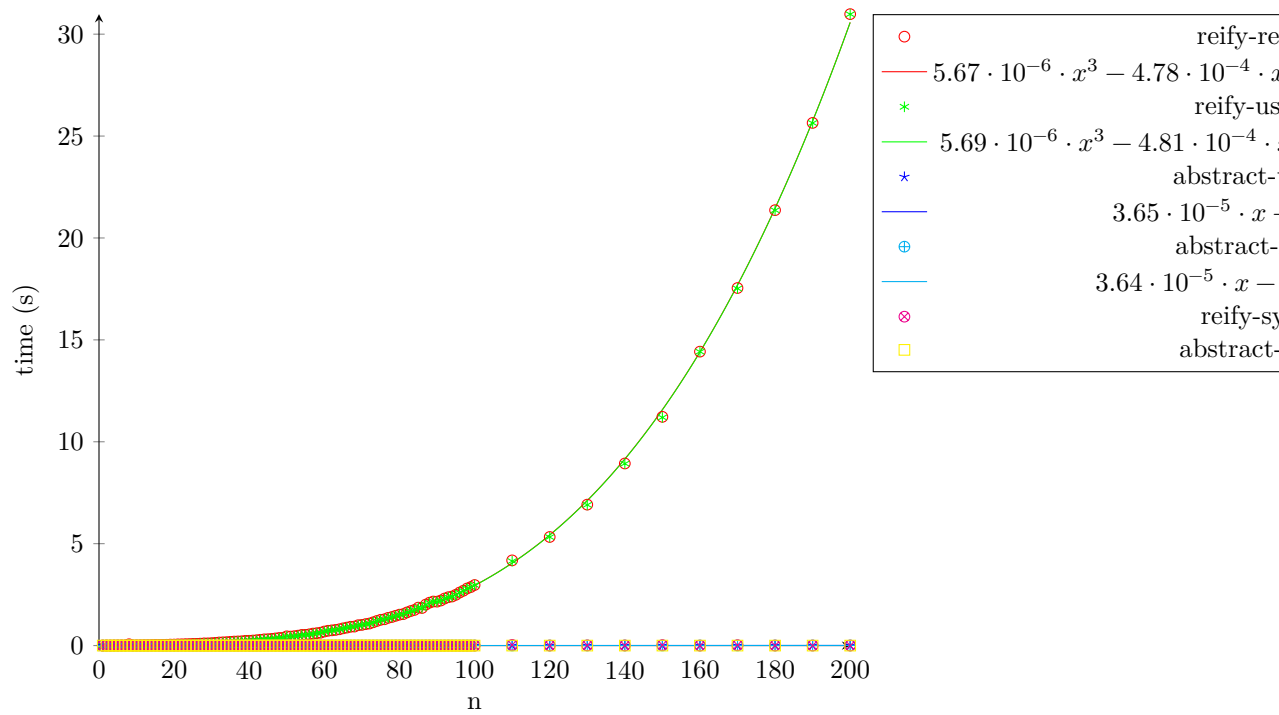Figure 12: timing-rewrite-repeated-app-fast-rewrite-no-abstract
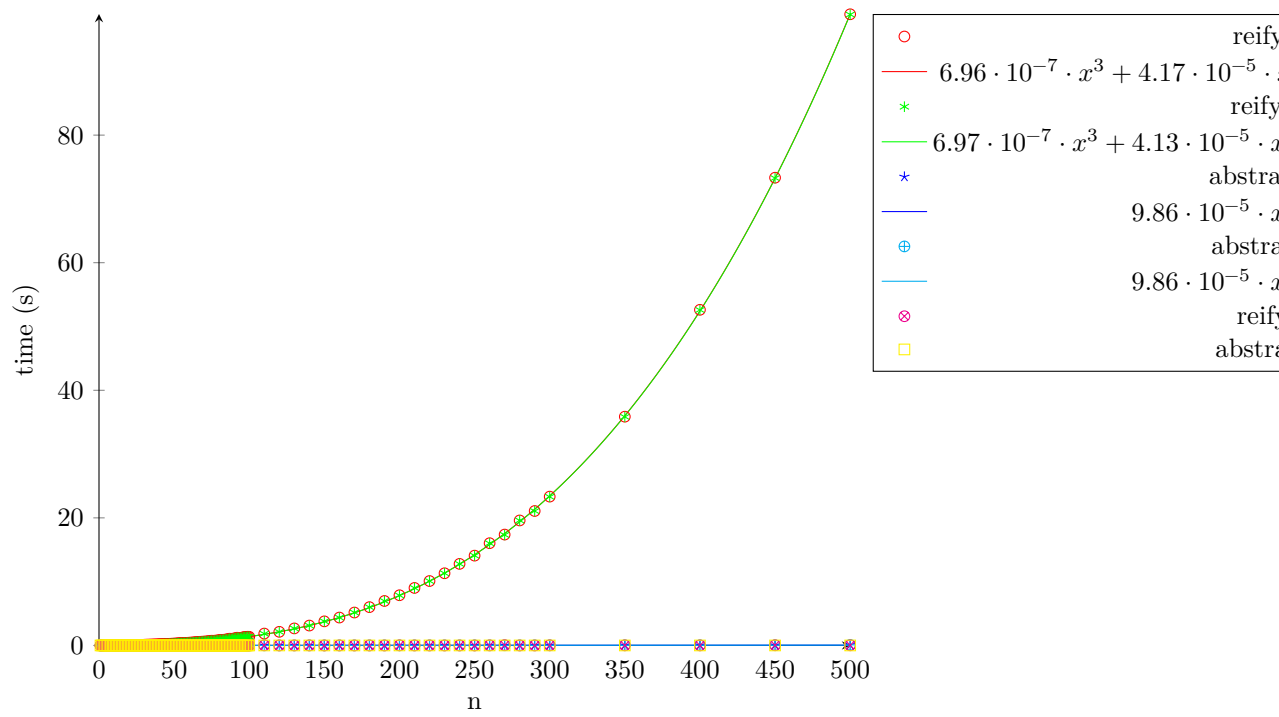
Figure 13: timing-typeclass-reification-let-in-HOAS

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

time (s)

n

Marker	Label	Fit
○	abstract-real	$2.35 \cdot 10^{-6} \cdot x^2 - 1.33 \cdot 10^{-3}$
✳	abstract-user	$2.35 \cdot 10^{-6} \cdot x^2 - 1.34 \cdot 10^{-3}$
★	fast-rewrite-real	$2.08 \cdot 10^{-6} \cdot x^2 - 1.35 \cdot 10^{-3}$
⊕	fast-rewrite-user	$2.08 \cdot 10^{-6} \cdot x^2 - 1.36 \cdot 10^{-3}$
⊗	check-admit-real	$3.61 \cdot 10^{-7} \cdot x^2 - 3.07 \cdot 10^{-4} \cdot x$
□	check-admit-user	$3.6 \cdot 10^{-7} \cdot x^2 - 3.06 \cdot 10^{-4} \cdot x$
■	type-admit-user	$3.57 \cdot 10^{-7} \cdot x^2 - 3.02 \cdot 10^{-4} \cdot x$
△	type-admit-real	$3.57 \cdot 10^{-7} \cdot x^2 - 3.02 \cdot 10^{-4} \cdot x$
▲	close-abstract-real	$2.68 \cdot 10^{-7} \cdot x^2 + 1.97 \cdot 10^{-5} \cdot x$
◇	close-abstract-user	$2.68 \cdot 10^{-7} \cdot x^2 + 1.88 \cdot 10^{-5} \cdot x$
◆	type-admit-cast-user	$3.14 \cdot 10^{-7} \cdot x^2 - 2.3 \cdot 10^{-4} \cdot x$
⬠	type-admit-cast-real	$3.14 \cdot 10^{-7} \cdot x^2 - 2.31 \cdot 10^{-4} \cdot x$
⬣	refine-real	$2.74 \cdot 10^{-7} \cdot x^2 - 2.04 \cdot 10^{-4} \cdot x$
		$3.65 \cdot 10^{-4} \cdot x - 4.3 \cdot$
–	refine-user	$2.74 \cdot 10^{-7} \cdot x^2 - 2.04 \cdot 10^{-4} \cdot x$
		$3.65 \cdot 10^{-4} \cdot x - 4.3 \cdot$
	check-pf-cast-user	$3.27 \cdot 10^{-7} \cdot x^2 - 2.52 \cdot 10^{-4} \cdot x$
●	check-pf-cast-real	$3.27 \cdot 10^{-7} \cdot x^2 - 2.51 \cdot 10^{-4} \cdot x$
●	type-pf-cast-user	$2.41 \cdot 10^{-7} \cdot x^2 - 1.5 \cdot 10^{-4} \cdot x$
○	type-pf-cast-real	$2.41 \cdot 10^{-7} \cdot x^2 - 1.49 \cdot 10^{-4} \cdot x$
✳	check-admit-cast-user	$2.03 \cdot 10^{-7} \cdot x^2 - 6.95 \cdot 10^{-5} \cdot x$
✳	check-admit-cast-real	$2.02 \cdot 10^{-7} \cdot x^2 - 6.81 \cdot 10^{-5} \cdot x$
⊕	build-eval-thunk-user	$1.01 \cdot 10^{-4} \cdot x - 9.73 \cdot$
⊗	build-eval-thunk-real	$1.02 \cdot 10^{-4} \cdot x - 8.25 \cdot$
□	build-thunk-real	$1.01 \cdot 10^{-4} \cdot x - 9.21 \cdot$
■	build-thunk-user	$1 \cdot 10^{-4} \cdot x - 9.69 \cdot 1$
△	type-L-user	

15