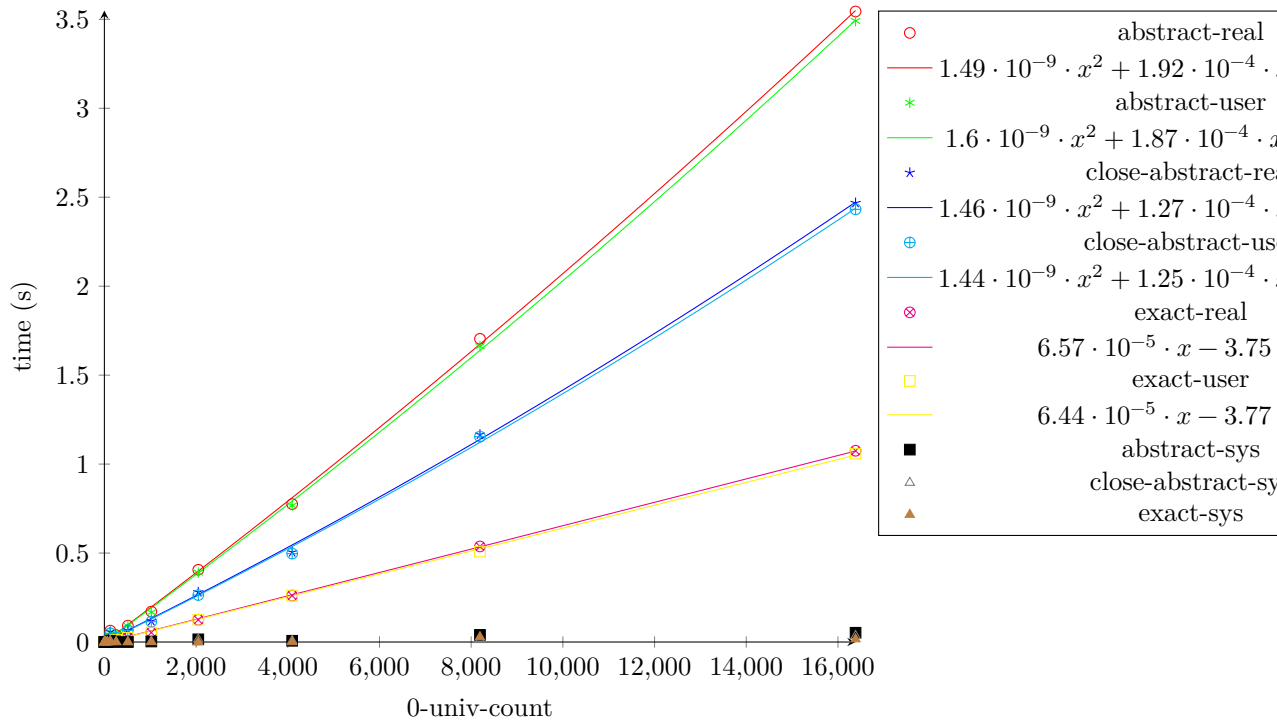Figure 1: timing-pattern

1

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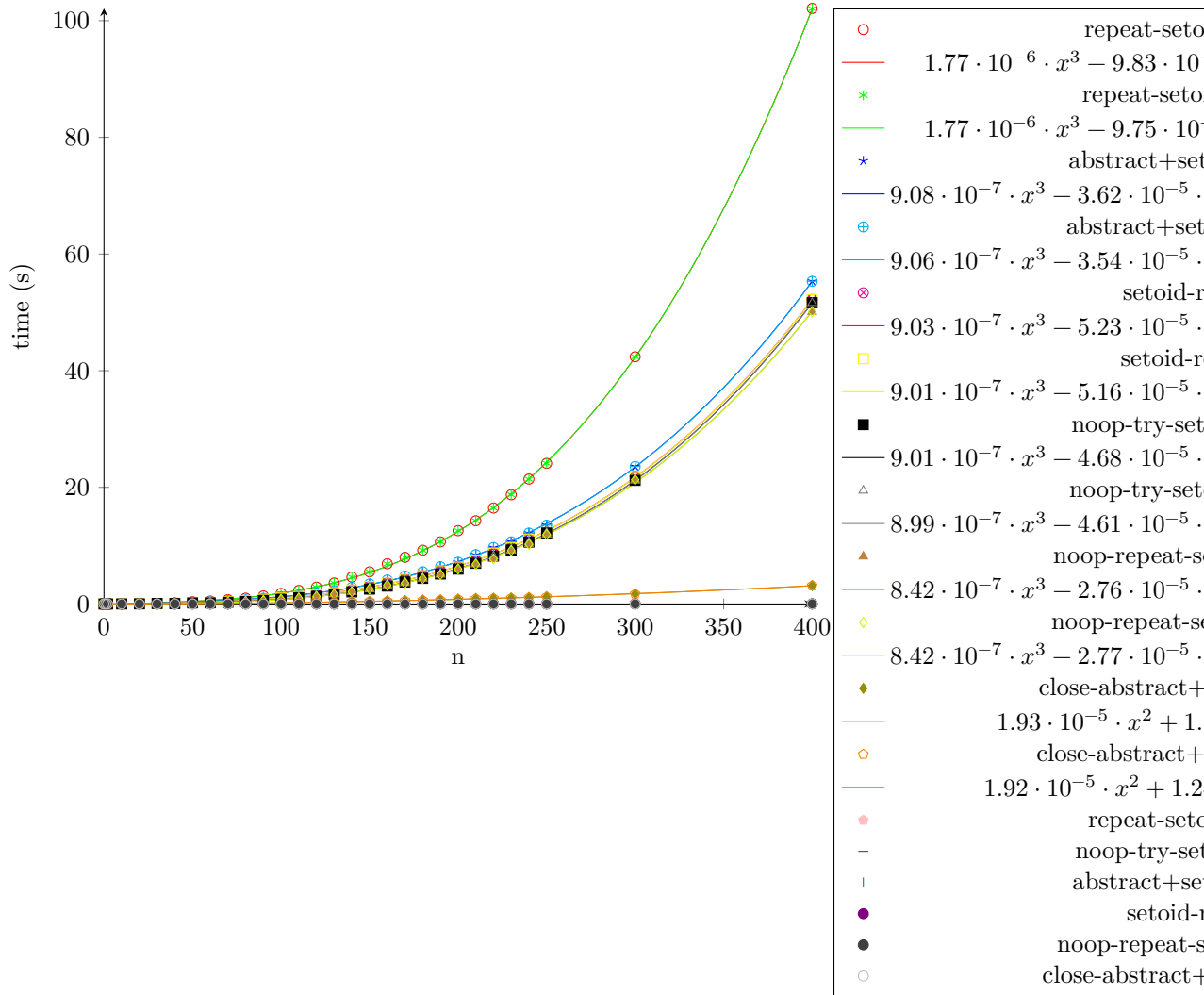
2

Figure 3: timing-repeat-setoid-rewrite-under-binders
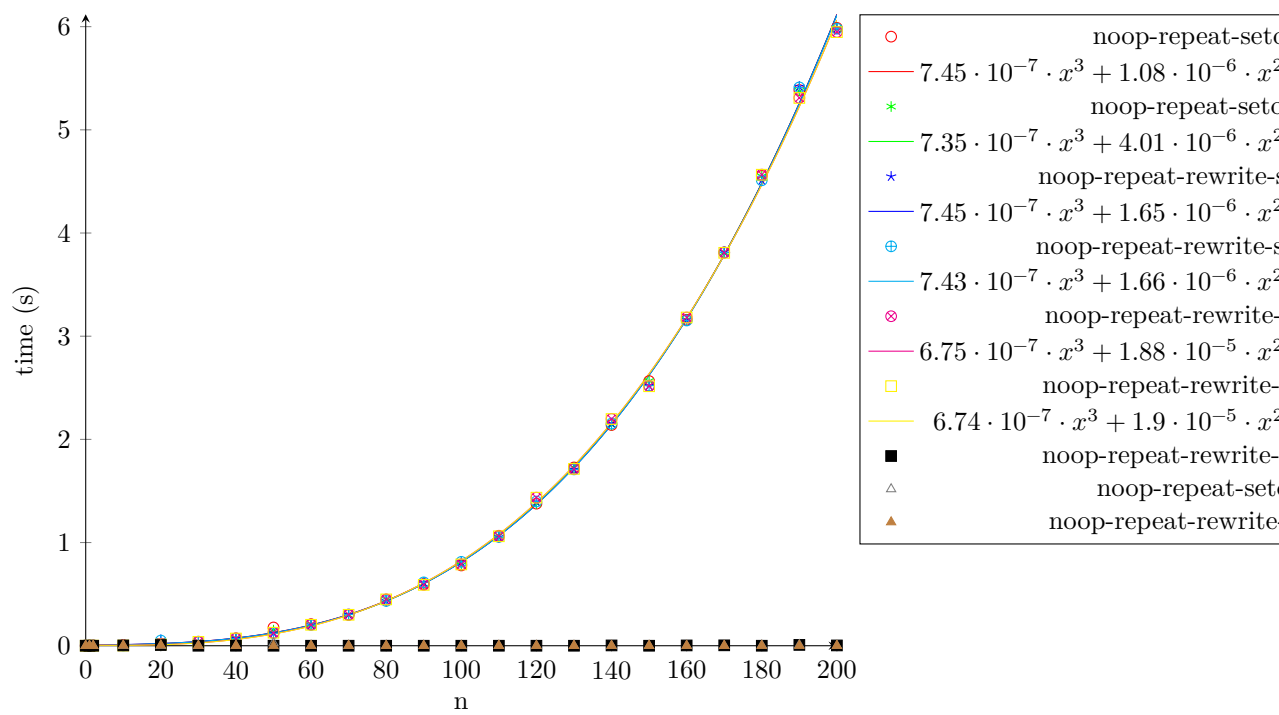
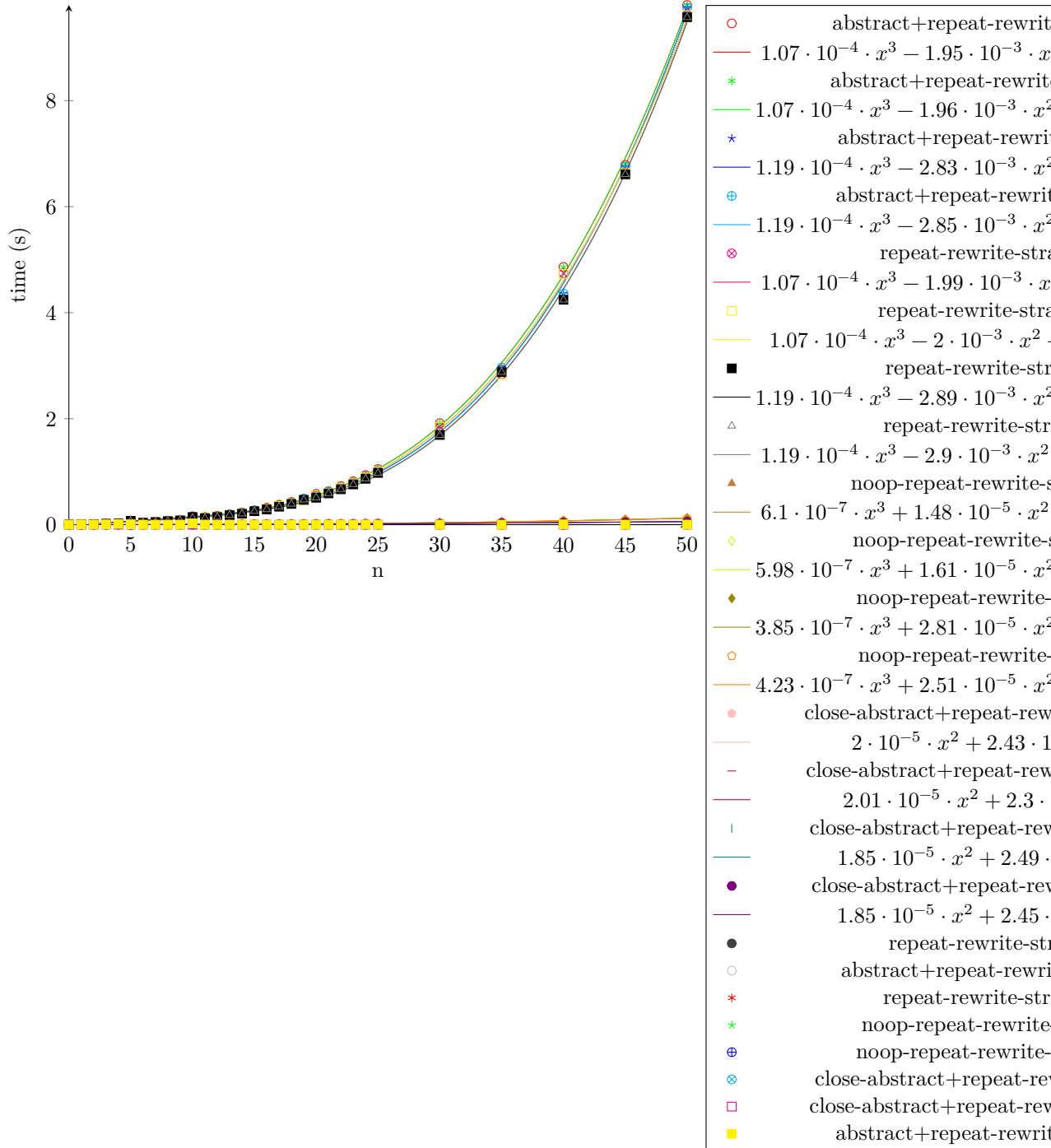Figure 4: timing-repeat-setoid-rewrite-under-binders-noop

4

time (s)

8

6

4

2

0

0   5   10   15   20   25   30   35   40   45   50

n

Legend:

○   abstract+repeat-rewrit
— $1.07 \cdot 10^{-4} \cdot x^3 - 1.95 \cdot 10^{-3} \cdot x$
∗   abstract+repeat-rewrit
— $1.07 \cdot 10^{-4} \cdot x^3 - 1.96 \cdot 10^{-3} \cdot x^2$
∗   abstract+repeat-rewri
— $1.19 \cdot 10^{-4} \cdot x^3 - 2.83 \cdot 10^{-3} \cdot x^2$
⊕   abstract+repeat-rewri
— $1.19 \cdot 10^{-4} \cdot x^3 - 2.85 \cdot 10^{-3} \cdot x^2$
⊗   repeat-rewrite-stra
— $1.07 \cdot 10^{-4} \cdot x^3 - 1.99 \cdot 10^{-3} \cdot x$
□   repeat-rewrite-stra
— $1.07 \cdot 10^{-4} \cdot x^3 - 2 \cdot 10^{-3} \cdot x^2$
■   repeat-rewrite-str
— $1.19 \cdot 10^{-4} \cdot x^3 - 2.89 \cdot 10^{-3} \cdot x^2$
△   repeat-rewrite-str
— $1.19 \cdot 10^{-4} \cdot x^3 - 2.9 \cdot 10^{-3} \cdot x^2$
▲   noop-repeat-rewrite-s
— $6.1 \cdot 10^{-7} \cdot x^3 + 1.48 \cdot 10^{-5} \cdot x^2$
◇   noop-repeat-rewrite-s
— $5.98 \cdot 10^{-7} \cdot x^3 + 1.61 \cdot 10^{-5} \cdot x^2$
◆   noop-repeat-rewrite-
— $3.85 \cdot 10^{-7} \cdot x^3 + 2.81 \cdot 10^{-5} \cdot x^2$
⬠   noop-repeat-rewrite-
— $4.23 \cdot 10^{-7} \cdot x^3 + 2.51 \cdot 10^{-5} \cdot x^2$
⬠   close-abstract+repeat-rew
— $2 \cdot 10^{-5} \cdot x^2 + 2.43 \cdot 1$
–   close-abstract+repeat-rew
— $2.01 \cdot 10^{-5} \cdot x^2 + 2.3 \cdot$
| close-abstract+repeat-rew
— $1.85 \cdot 10^{-5} \cdot x^2 + 2.49 \cdot$
●   close-abstract+repeat-rew
— $1.85 \cdot 10^{-5} \cdot x^2 + 2.45 \cdot$
●   repeat-rewrite-str
○   abstract+repeat-rewri
∗   repeat-rewrite-str
∗   noop-repeat-rewrite
⊕   noop-repeat-rewrite-
⊗   close-abstract+repeat-rev
□   close-abstract+repeat-rev
■   abstract+repeat-rewrit

Figure 5: timing-rewrite-strat-under-binders
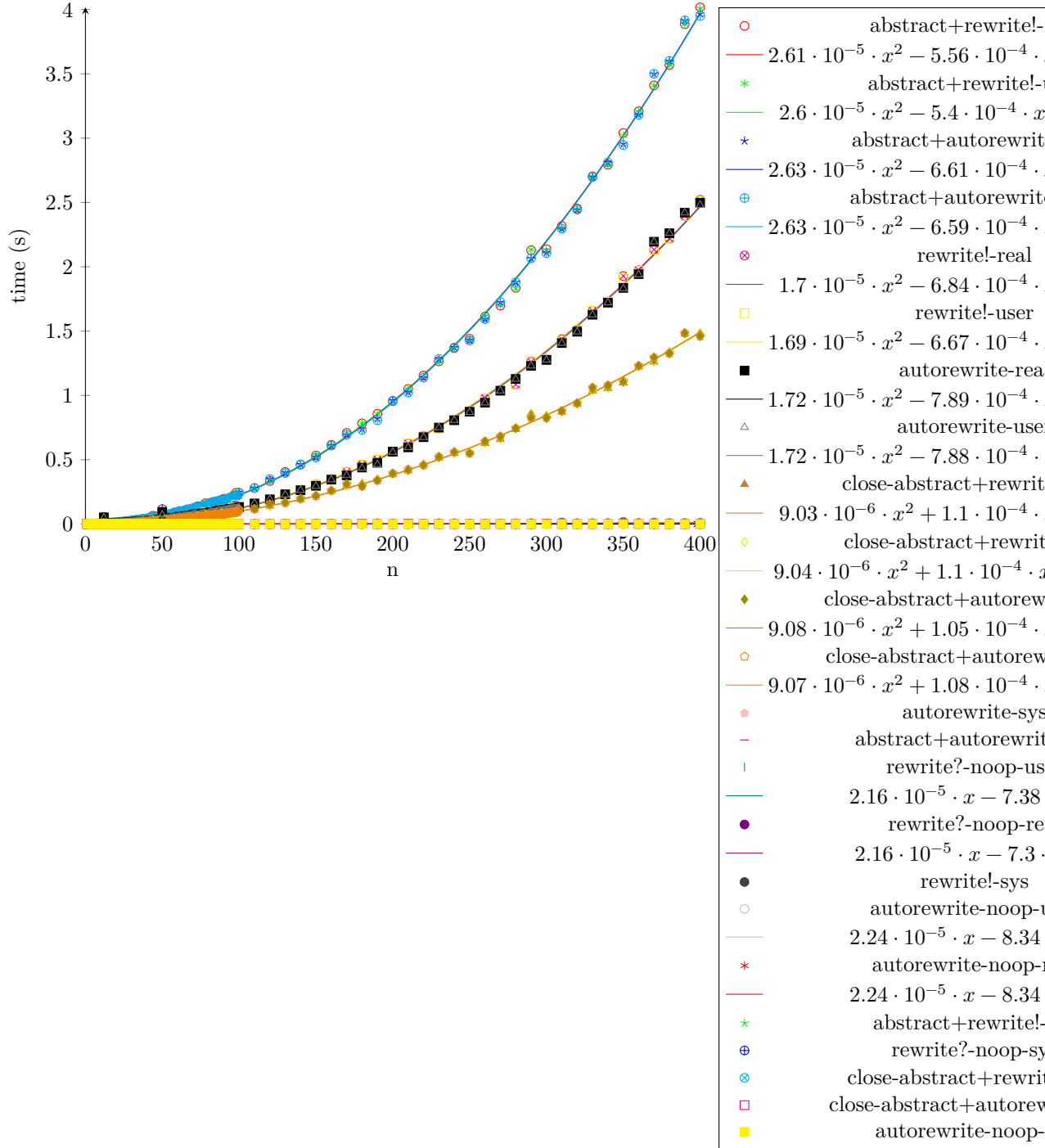
Figure 6: timing-rewrite-repeated-app-autorewrite

6

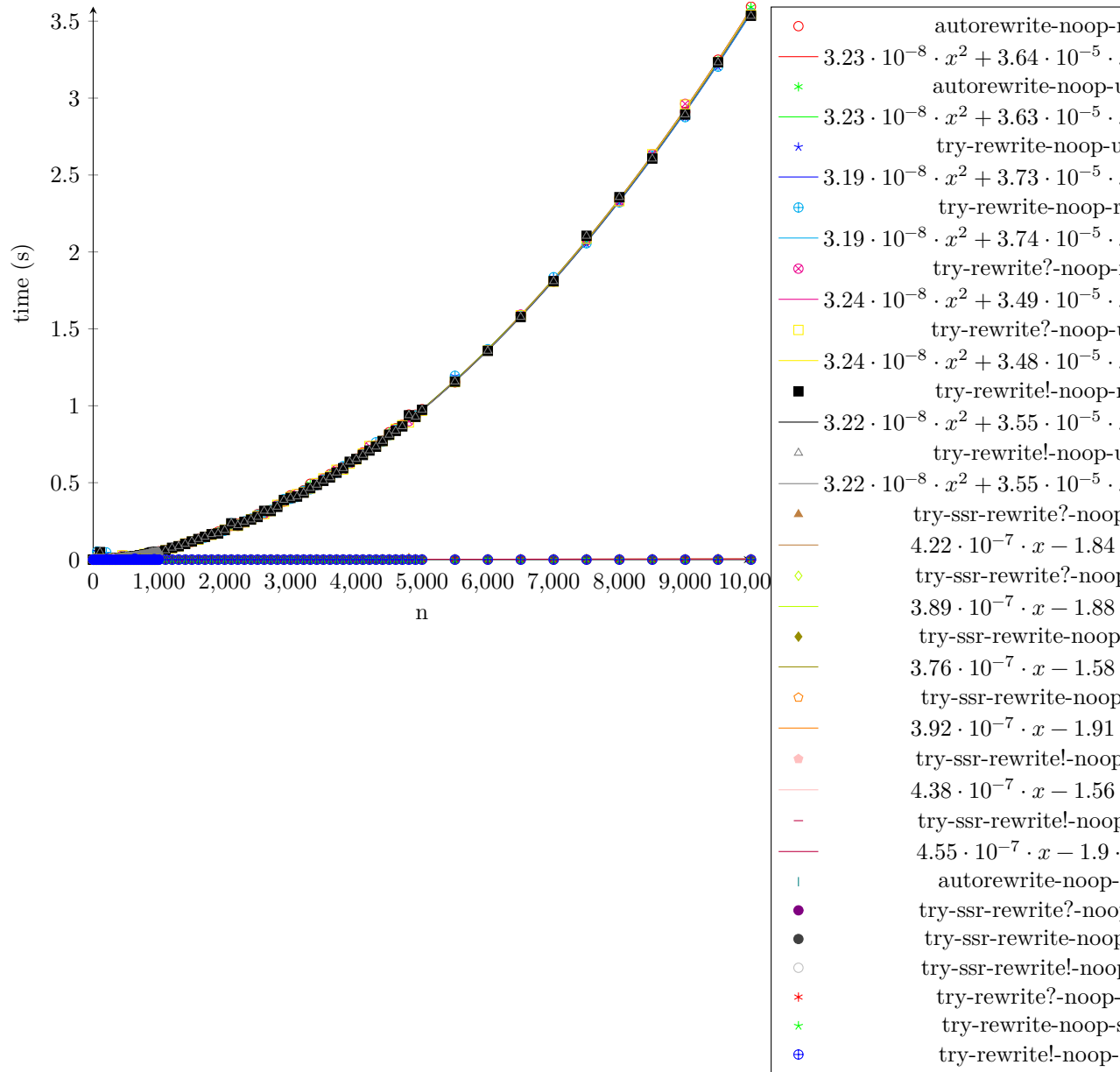|	autorewrite-noop-r
	$3.23 \cdot 10^{-8} \cdot x^2 + 3.64 \cdot 10^{-5} \cdot$
	autorewrite-noop-u
	$3.23 \cdot 10^{-8} \cdot x^2 + 3.63 \cdot 10^{-5} \cdot$
	try-rewrite-noop-u
	$3.19 \cdot 10^{-8} \cdot x^2 + 3.73 \cdot 10^{-5} \cdot$
	try-rewrite-noop-r
	$3.19 \cdot 10^{-8} \cdot x^2 + 3.74 \cdot 10^{-5} \cdot$
	try-rewrite?-noop-
	$3.24 \cdot 10^{-8} \cdot x^2 + 3.49 \cdot 10^{-5} \cdot$
	try-rewrite?-noop-u
	$3.24 \cdot 10^{-8} \cdot x^2 + 3.48 \cdot 10^{-5} \cdot$
	try-rewrite!-noop-r
	$3.22 \cdot 10^{-8} \cdot x^2 + 3.55 \cdot 10^{-5} \cdot$
	try-rewrite!-noop-u
	$3.22 \cdot 10^{-8} \cdot x^2 + 3.55 \cdot 10^{-5} \cdot$
	try-ssr-rewrite?-noop
	$4.22 \cdot 10^{-7} \cdot x - 1.84$
	try-ssr-rewrite?-noop
	$3.89 \cdot 10^{-7} \cdot x - 1.88$
	try-ssr-rewrite-noop
	$3.76 \cdot 10^{-7} \cdot x - 1.58$
	try-ssr-rewrite-noop
	$3.92 \cdot 10^{-7} \cdot x - 1.91$
	try-ssr-rewrite!-noop
	$4.38 \cdot 10^{-7} \cdot x - 1.56$
	try-ssr-rewrite!-noop
	$4.55 \cdot 10^{-7} \cdot x - 1.9 \cdot$
	autorewrite-noop-
	try-ssr-rewrite?-noo
	try-ssr-rewrite-noop
	try-ssr-rewrite!-noop
	try-rewrite?-noop-
	try-rewrite-noop-s
	try-rewrite!-noop-

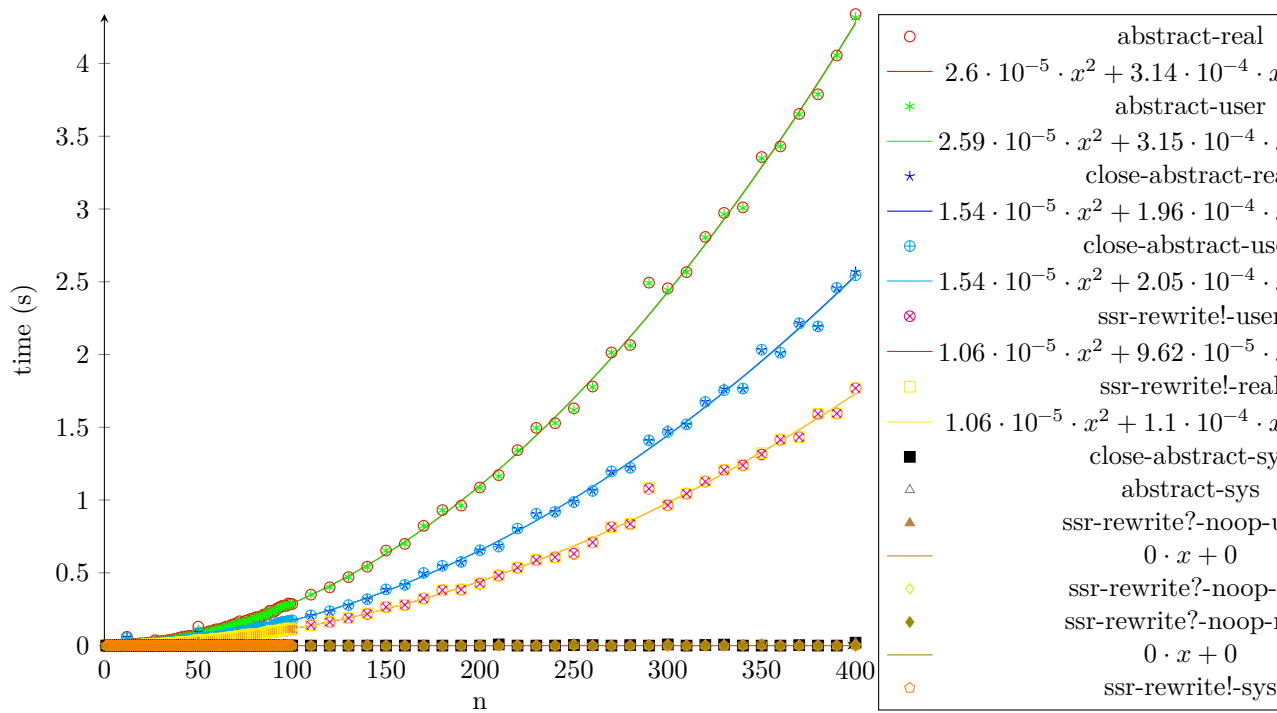Figure 7: timing-rewrite-repeated-app-autorewrite-noop

7

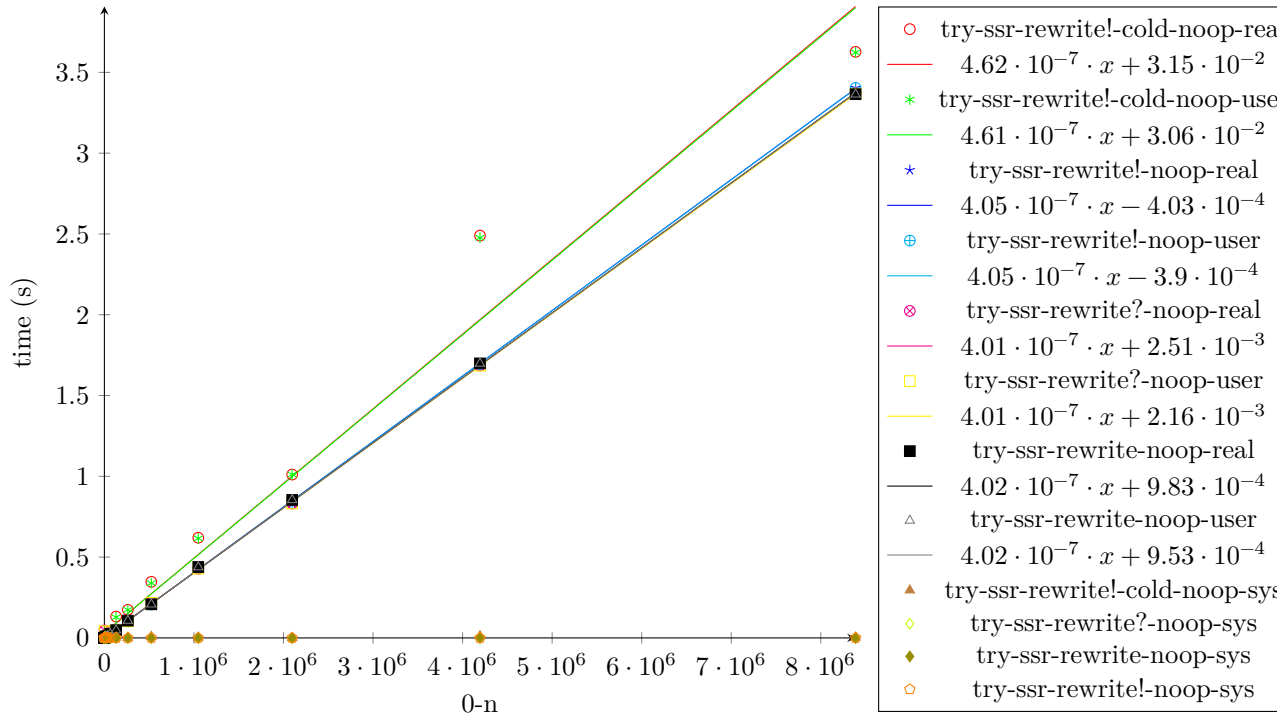Figure 8: timing-rewrite-repeated-app-ssrrewrite

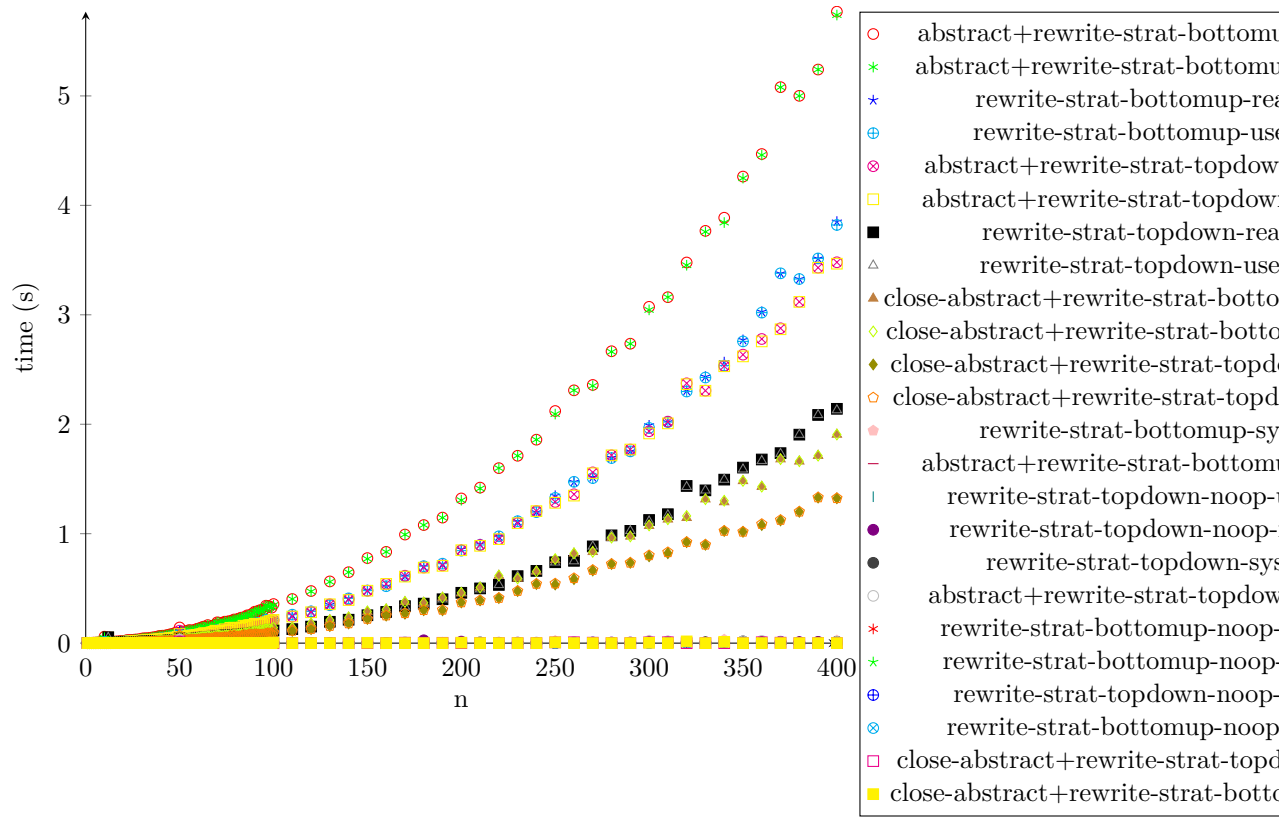Figure 9: timing-rewrite-repeated-app-ssrrewrite-noop param-1-lgn 1

9

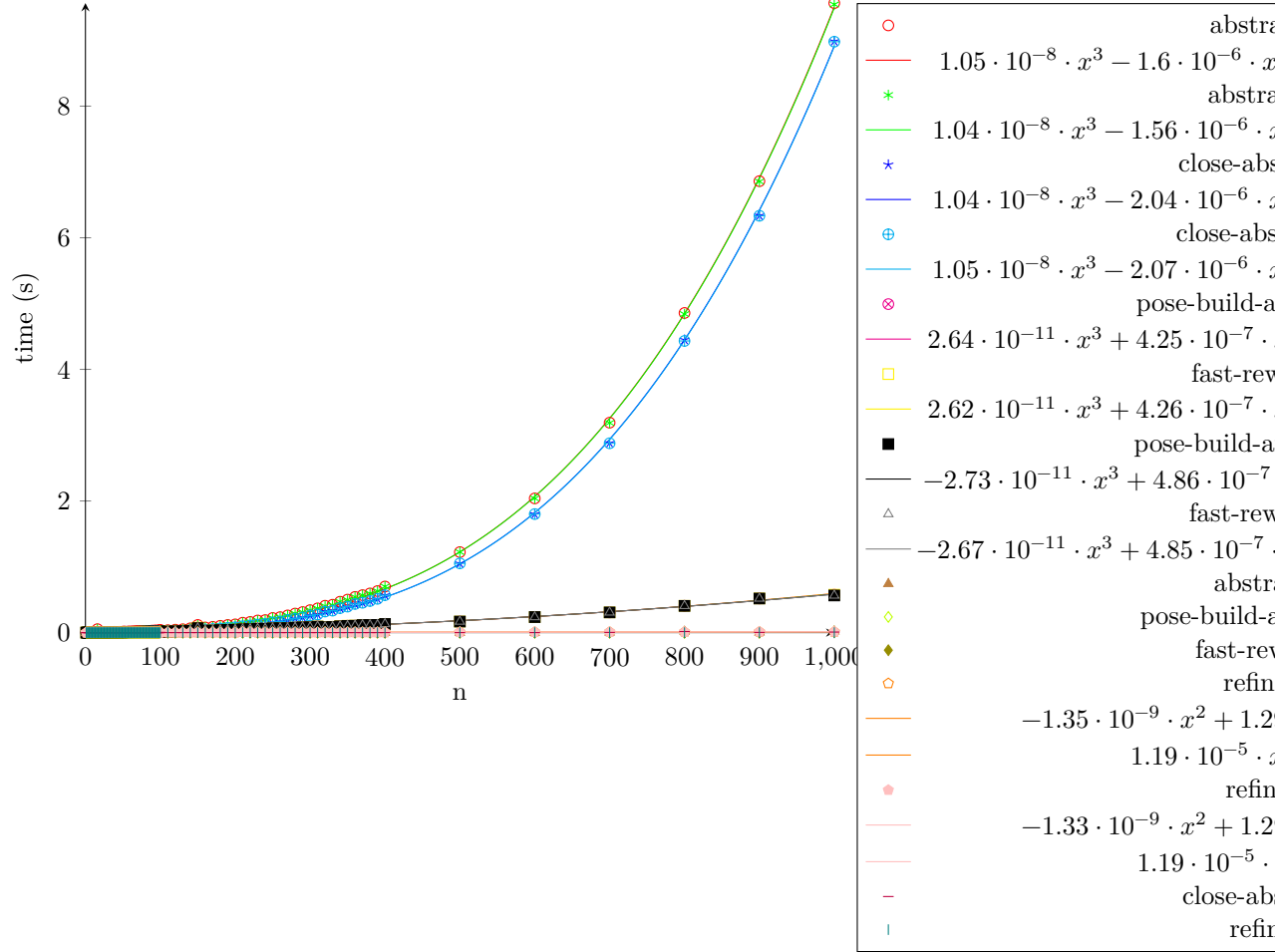Figure 10: timing-rewrite-repeated-app-rewrite-strat

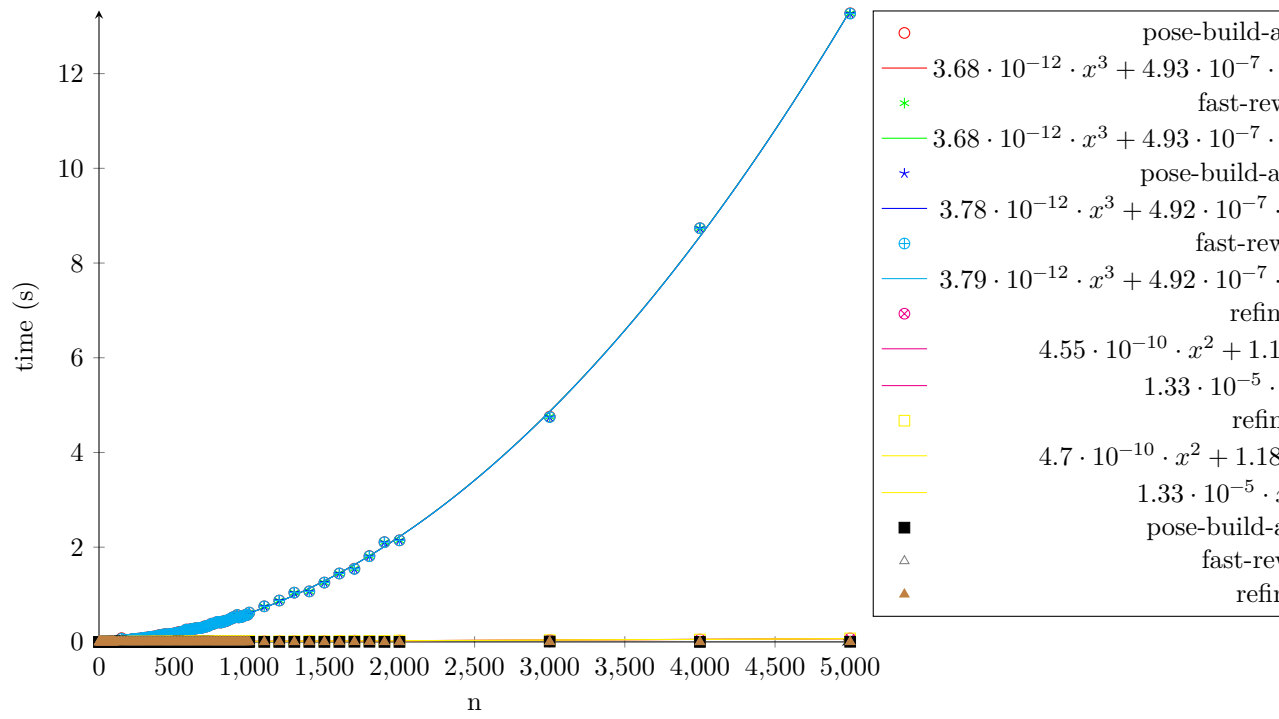Figure 11: timing-rewrite-repeated-app-fast-rewrite

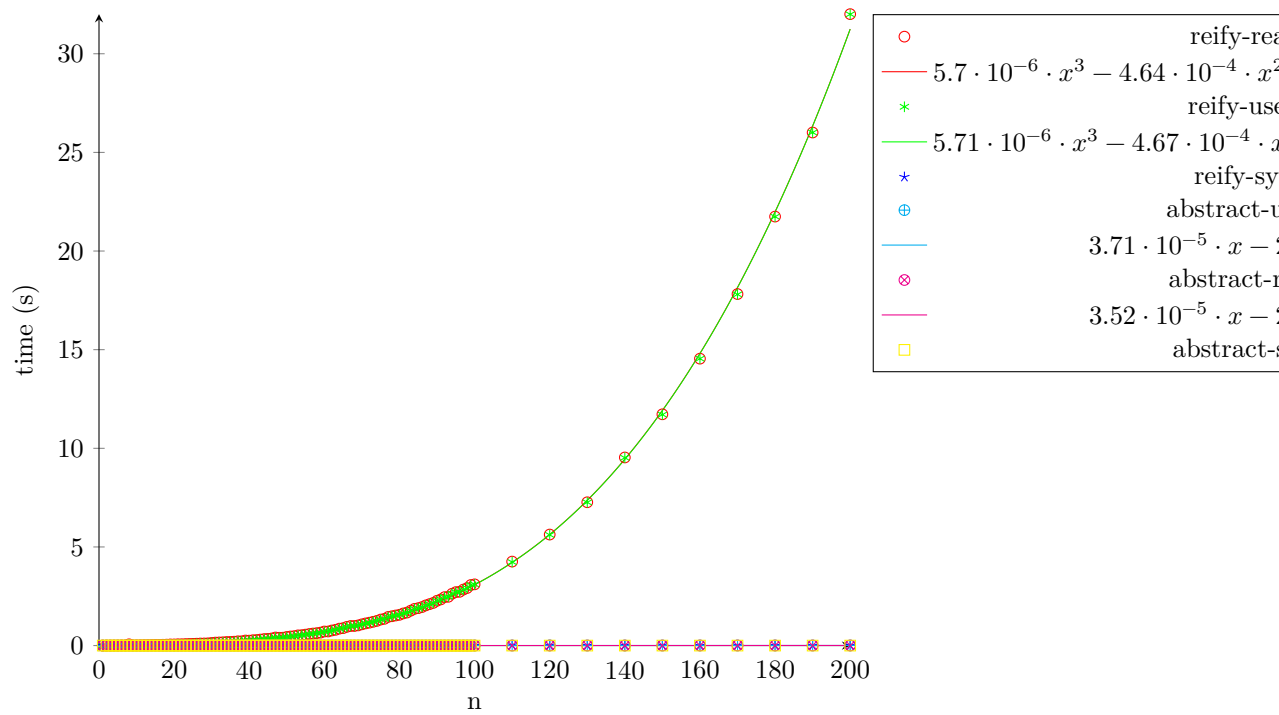Figure 12: timing-rewrite-repeated-app-fast-rewrite-no-abstract
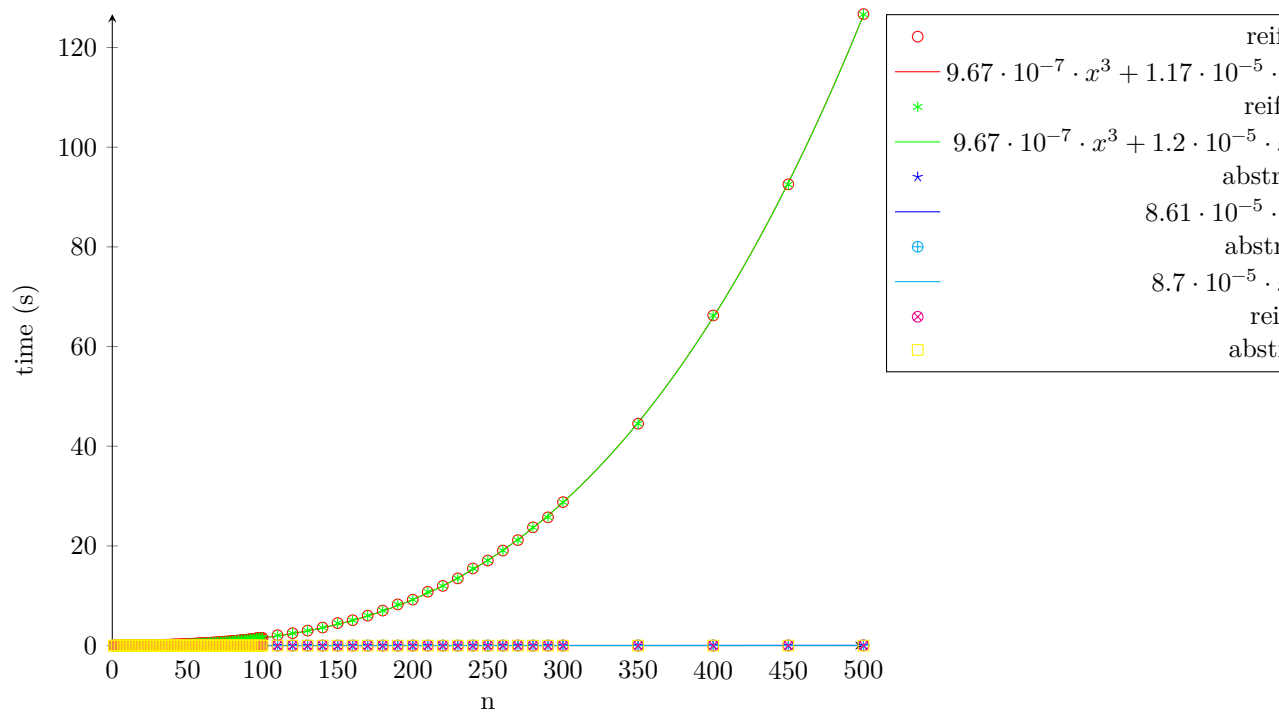
Figure 13: timing-typeclass-reification-let-in-HOAS

13

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

time (s)

16

14

12

10

8

6

4

2

0

0   500   1,000   1,500   2,000   2,500   3,000

n

○	abstract-real
—	$1.78 \cdot 10^{-6} \cdot x^2 + 3.6 \cdot 10^{-4} \cdot x$
∗	abstract-user
—	$1.78 \cdot 10^{-6} \cdot x^2 + 3.58 \cdot 10^{-4} \cdot x$
⋆	fast-rewrite-real
—	$1.43 \cdot 10^{-6} \cdot x^2 + 3.22 \cdot 10^{-4} \cdot x$
⊕	fast-rewrite-user
—	$1.43 \cdot 10^{-6} \cdot x^2 + 3.2 \cdot 10^{-4} \cdot x$
⊗	close-abstract-user
—	$3.48 \cdot 10^{-7} \cdot x^2 + 3.6 \cdot 10^{-5} \cdot x$
□	close-abstract-real
—	$3.48 \cdot 10^{-7} \cdot x^2 + 3.66 \cdot 10^{-5} \cdot x$
■	type-admit-user
—	$2.27 \cdot 10^{-7} \cdot x^2 - 6.24 \cdot 10^{-6} \cdot x$
△	type-admit-real
—	$2.27 \cdot 10^{-7} \cdot x^2 - 5.7 \cdot 10^{-6} \cdot x$
▲	check-admit-user
—	$2.22 \cdot 10^{-7} \cdot x^2 + 1.18 \cdot 10^{-6} \cdot x$
◇	check-admit-real
—	$2.22 \cdot 10^{-7} \cdot x^2 + 1.38 \cdot 10^{-6} \cdot x$
◆	type-admit-cast-real
—	$2.2 \cdot 10^{-7} \cdot x^2 + 1.05 \cdot 10^{-5} \cdot x$
⬠	type-admit-cast-user
—	$2.2 \cdot 10^{-7} \cdot x^2 + 1.05 \cdot 10^{-5} \cdot x$
⬠	refine-real
—	$1.9 \cdot 10^{-7} \cdot x^2 + 2.85 \cdot 10^{-5} \cdot x$
—	$4.24 \cdot 10^{-4} \cdot x - 4.46 \cdot$
−	refine-user
—	$1.9 \cdot 10^{-7} \cdot x^2 + 2.87 \cdot 10^{-5} \cdot x$
—	$4.24 \cdot 10^{-4} \cdot x - 4.46 \cdot$
∣	check-pf-cast-user
—	$2.21 \cdot 10^{-7} \cdot x^2 - 2.57 \cdot 10^{-6} \cdot x$
●	check-pf-cast-real
—	$2.21 \cdot 10^{-7} \cdot x^2 - 2.86 \cdot 10^{-6} \cdot x$
●	type-pf-cast-user
—	$1.7 \cdot 10^{-7} \cdot x^2 + 6.12 \cdot 10^{-5} \cdot x$
○	type-pf-cast-real
—	$1.69 \cdot 10^{-7} \cdot x^2 + 6.17 \cdot 10^{-5} \cdot x$
∗	check-admit-cast-user
—	$1.75 \cdot 10^{-7} \cdot x^2 + 6.83 \cdot 10^{-5} \cdot x$
∗	check-admit-cast-real
—	$1.75 \cdot 10^{-7} \cdot x^2 + 6.87 \cdot 10^{-5} \cdot x$
⊕	build-eval-thunk-user
—	$1.03 \cdot 10^{-4} \cdot x - 9.09 \cdot$
⊗	build-eval-thunk-real
—	$1.03 \cdot 10^{-4} \cdot x - 7.59 \cdot$
□	build-thunk-user
—	$1.02 \cdot 10^{-4} \cdot x - 1.03 \cdot$
■	build-thunk-real
—	$1.02 \cdot 10^{-4} \cdot x - 8.68 \cdot$
△	type-L-user