

## lib/main/map\_unittest.ath

```

1  load "map"
2
3  open Map
4
5  (define M1 [[1 --> 'a] [2 --> 'b] [1 --> 'c]])
6  (define M2 [['a --> true] ['b --> false] ['foo --> true]])
7  (eval M2 o M1)
8
9  (define [t1 t2] [(alist->map M2) (alist->map M1)])
10
11  define capitals :=
12    [['paris --> 'france] ['tokyo --> 'japan] ['cairo --> 'egypt]]
13
14  define countries :=
15    [['france --> 'europe] ['algeria --> 'africa] ['japan --> 'asia]]
16
17  (eval countries o capitals)
18
19  # (falsify composition-is-comm 20)
20
21  # (falsify composition-is-assoc 20)
22
23  # (falsify (close ((m3 o m2) o m1) = m3 o (m2 o m1))) 20)
24
25  # (falsify comp2-is-comm 10)
26
27  # (falsify comp2-is-assoc 80)
28
29  # (falsify comp2-app-lemma 10)
30
31  (eval [[1 --> 'a] [2 --> 'b]] <-> [[1 --> 'a] [3 --> 'c]])
32
33  (eval [[1 --> 'a] [2 --> 'b]] <-> [[1 --> 'a] [2 --> 'foo] [3 --> 'c]])
34
35  define compatible-theorem-1 := (forall m . m <-> m)
36
37  (falsify compatible-theorem-1 20)
38
39  define compatible-theorem-2 := (forall m1 m2 . m1 <-> m2 <==> m2 <-> m1)
40
41  (running-time (lambda () (falsify compatible-theorem-2 10)) 0)
42  # with new eval1: 4.22
43
44  define compatible-theorem-3 := (forall m1 m2 m3 . m1 <-> m2 & m2 <-> m3 ==> m1 <-> m3)
45
46  # (falsify compatible-theorem-3 10)
47
48  (define [s t hyp] [(apply ?tail:(Map 'T1 'T2)
49    ?k:'T1)
50
51    (apply ([?key:'T1 val] ++ ?tail:(Map 'T1 'T2))
52      ?k:'T1)
53
54    (?key:'T1 /= ?k:'T1)]) /
55
56  (assume hyp
57    (!chain [s = t [apply-axioms]]))
58
59
60  define M' := [[1 --> 'a] [2 --> 'bar] [1 --> 'c]]
61
62  (eval agree-on M M' [1])
63  (eval agree-on M M' [2])
64
65  define ag-conjecture-1 :=
66    (forall S m . agree-on m m S)
67

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68 # Older map identity:
69 #assert* map-identity :=
70 # (m1 = m2 <==> dom m1 = dom m2 & (agree-on m1 m2 dom m1));;
71
72 define agree-characterization :=
73   (forall S m1 m2 . (agree-on m1 m2 S) <==> forall x . x in S ==> m1 applied-to x = m2 applied-to x)
74
75 # by-induction agree-characterization {
76 #   (S as Set.null) =>
77 #     pick-any m1 m2
78 #     let {dir1 := assume hyp := (agree-on m1 m2 null)}
79 #       pick-any x
80 #       (!chain [(x in S) ==> false [Set.null-characterization]
81 #                ==> (m1 applied-to x = m2 applied-to x) [prop-taut]]);
82 #       dir2 := assume hyp := (forall x . x in null ==> m1 applied-to x = m2 applied-to x)
83 #       (!chain-> [true ==> (agree-on m1 m2 S) [agree-on-axioms]])}
84 #   (!equiv dir1 dir2)
85 # | (S as (Set.insert h t)) =>
86 #   let {dir1 := assume hyp := (agree-on m1 m2 S)}
87 # }
88
89 #(falsify agree-characterization 10)
90 #(!induction* agree-characterization)
91
92 (eval (empty-map:(Map Int Int) at 1))
93
94 (eval M applied-to 1)
95 (eval M applied-to 2)
96 (eval M applied-to 97)
97 (eval M - 1 applied-to 2)
98 (eval M - 1 applied-to 1)
99
100 (define M1 [[1 --> 'a] [2 --> 'b] [1 --> 'c]])
101
102 (define M2 [['a --> true] ['b --> false] ['foo --> true]])
103
104 (eval M2 o M1)
105
106 #(falsify composition-is-assoc 10)
107
108 define [n] := [?n:N]
109
110 let {m := (alist->map [[1 --> 2] [2 --> 3] [3 --> 1]]);
111     _ := (print "\nm iterated once: " (eval m ^ 1));
112     _ := (print "\nm iterated twice: " (eval m ^ 2));
113     _ := (print "\nm iterated thrice: " (eval m ^ 3))}
114 (print "\nAre m and m^3 identical?: " (eval m = m ^ 3))
115
116 (eval [[1 --> 'a] [2 --> 'b]] <-> [[1 --> 'a] [3 --> 'c]])
117
118 (eval [[1 --> 'a] [2 --> 'b]] <-> [[1 --> 'a] [2 --> 'foo] [3 --> 'c]])
119
120 define compatible-theorem-1 := (forall m . m <-> m)
121
122 (falsify compatible-theorem-1 20)
123
124 define compatible-theorem-2 := (forall m1 m2 . m1 <-> m2 <==> m2 <-> m1)
125
126 #(running-time (lambda () (falsify compatible-theorem-2 50)) 0)
127 # with new eval1: 4.22
128
129 define compatible-theorem-3 := (forall m1 m2 m3 . m1 <-> m2 & m2 <-> m3 ==> m1 <-> m3)
130
131 #(falsify compatible-theorem-3 10)
132
133 #(define remove-correctness
134 # (forall m x . (m - x) applied-to x = NONE))
135
136 #(holds? remove-correctness)
137 #(!induction* remove-correctness)

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138
139 #(falsify remove-correctness 100)
140
141 #(define conj
142 #  (close (agree-on m1 m2 A) <==> m1 ^ A = m2 ^ A))
143 #?  (close (agree-on m1 m2 A) <==> m1 |^ A = m2 |^ A))
144
145 #(!induction* conj)
```