

Pensieve header:  $\mu$ -calculus testing suite.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2013-04"];
<< FreeLie.m
$SeriesShowDegree = 3; $SeriesCompareDegree = 5;
<< muCalculus.m
```

## Testing The Calculus

### 1. "tha" things:

```
 $\mu$ 1 = M[{
  2 → RandomLieSeries[{"1", "2"}]
}, MakeCWSeries[0]
];
( $\mu$ 1 // tha[1, 2] // hS[2] // tha[1, 2] // hS[2]) ==  $\mu$ 1
True
```

### 2. "dm" things: Associativity

```
 $\mu$ 4 = M[{
  1 → RandomLieSeries[{"1", "2", "3", "4"}],
  2 → RandomLieSeries[{"1", "2", "3", "4"}],
  3 → RandomLieSeries[{"1", "2", "3", "4"}],
  4 → RandomLieSeries[{"1", "2", "3", "4"}]
}, RandomCWSeries[{"1", "2", "3", "4"}]
];
( $\mu$ 4 // dm[1, 2, 1] // dm[1, 3, 1]) == ( $\mu$ 4 // dm[2, 3, 2] // dm[1, 2, 1])
True
```

### 3. "S" Things: tS[a] // tS[a] == Id, hS[a] // hS[a] == Id, dS[a] // dS[a] == Id

```
 $\mu$ 1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
 $\mu$ 1 == ( $\mu$ 1 // tS[1] // tS[1])
True
```

```
 $\mu$ 1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
 $\mu$ 1 == ( $\mu$ 1 // hS[1] // hS[1])
True
```

```

μ1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
μ1 ≡ (μ1 // dS[1] // dS[1])
True

```

#### 4. "A" Things: tA[a] // tA[a] == Id, hA[a] // hA[a] == Id, dA[a] // dA[a] == Id

```

μ1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
μ1 ≡ (μ1 // tA[1] // tA[1])
True

```

```

μ1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
μ1 ≡ (μ1 // hA[1] // hA[1])
True

```

```

μ1 = M[{
  1 → RandomLieSeries[{"1", "2"}],
  2 → RandomLieSeries[{"1", "2"}]
}, RandomCWSeries[{"1", "2"}]
];
μ1 ≡ (μ1 // dA[1] // dA[1])
True

```

## Testing Reidemeister Moves

```

R[1, 1, p] ≡ (R[1, 2, p] // dm[2, 1, 1])
True

```

```

R+[1, 2]

```

```

M[{1 → LS[0, 0, 0], 2 → LS[1, 0, 0]}, CWS[0, 0, 0]]

```

```

{t1 = R+[1, 2] ** R-[1, 2], t2 = de[1] ** de[2], t1 ≡ t2}

```

```

{M[{1 → LS[0, 0, 0], 2 → LS[0, 0, 0]}, CWS[0, 0, 0]],
 M[{1 → LS[0, 0, 0], 2 → LS[0, 0, 0]}, CWS[0, 0, 0]], True}

```

$\{t1 = R^+[1, 2] ** R^+[1, 3] ** R^+[2, 3], t2 = R^+[2, 3] ** R^+[1, 3] ** R^+[1, 2], t1 \equiv t2\}$

$\{M\left[\left\{1 \rightarrow LS[0, 0, 0], 2 \rightarrow LS[1, 0, 0], 3 \rightarrow LS\left[1 + 2, \frac{\overline{12}}{2}, \frac{1}{12} \overline{112} + \frac{1}{12} \overline{122}\right]\right\},\right.$   
 $CWS[0, 0, 0]\}, M\left[\left\{1 \rightarrow LS[0, 0, 0], 2 \rightarrow LS[1, 0, 0],\right.\right.$   
 $\left.3 \rightarrow LS\left[1 + 2, \frac{\overline{12}}{2}, \frac{1}{12} \overline{112} + \frac{1}{12} \overline{122}\right]\right\}, CWS[0, 0, 0]\}, True\}$