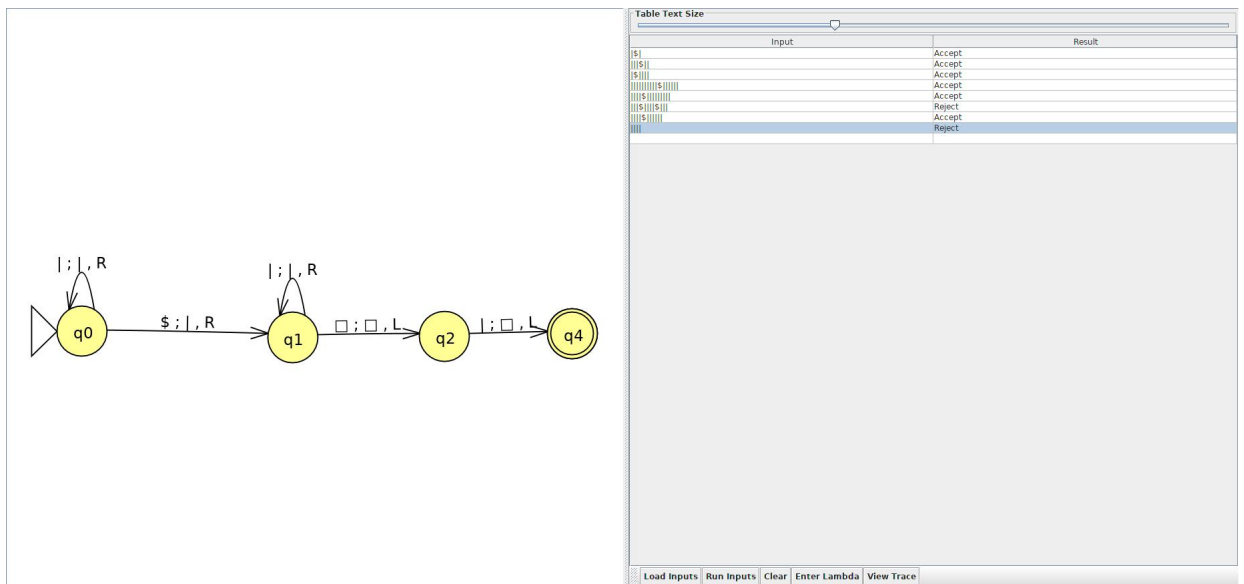


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1.



2.

$$\langle\langle \pi_1^1 | \sigma(\pi_3^3) \rangle \rangle | \sigma(\pi_4^4) \rangle$$

```
>> evalrecfunction('<<pi^1_1|sigma(pi^3_3)>>|sigma(pi^4_4)>',3,4,2)
<<pi^1_1|sigma(pi^3_3)>>|sigma(pi^4_4)>(3,4,2)
<<pi^1_1|sigma(pi^3_3)>>|sigma(pi^4_4)>(3,4,1)
<<pi^1_1|sigma(pi^3_3)>>|sigma(pi^4_4)>(3,4,0)
<pi^1_1|sigma(pi^3_3)>(3,4)
<pi^1_1|sigma(pi^3_3)>(3,3)
<pi^1_1|sigma(pi^3_3)>(3,2)
<pi^1_1|sigma(pi^3_3)>(3,1)
<pi^1_1|sigma(pi^3_3)>(3,0)
pi^1_1(3) = 3
sigma(pi^3_3)(3,0,3)
pi^3_3(3,0,3) = 3

sigma(3) = 4
sigma(pi^3_3)(3,1,4)
pi^3_3(3,1,4) = 4

sigma(4) = 5
sigma(pi^3_3)(3,2,5)
pi^3_3(3,2,5) = 5

sigma(5) = 6
sigma(pi^3_3)(3,3,6)
pi^3_3(3,3,6) = 6

sigma(6) = 7
sigma(pi^4_4)(3,4,0,7)
pi^4_4(3,4,0,7) = 7

sigma(7) = 8
sigma(pi^4_4)(3,4,1,8)
pi^4_4(3,4,1,8) = 8

sigma(8) = 9
ans = 9
```

3.

$Q = (3, s)$

s:

```
 $X_4 := X_1;$   
while  $X_2 \neq 0$  do  
   $X_4 := X_4 + 1;$   
   $X_2 := X_2 - 1;$   
od  
while  $X_3 \neq 0$  do  
   $X_4 := X_4 + 1;$   
   $X_3 := X_3 - 1$   
od  
 $X_1 := X_4;$ 
```