Práctica 3

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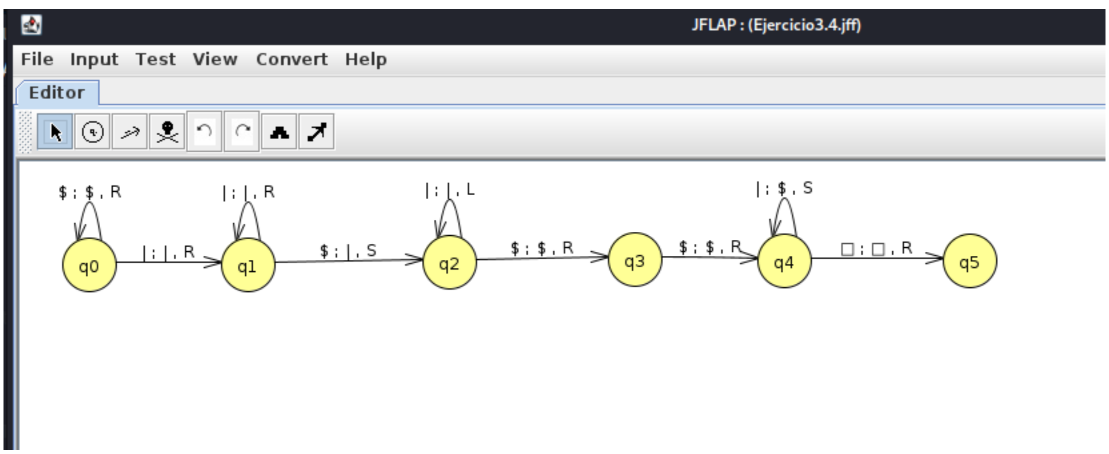
2022-2023

1 Define the TM solution of exercise 3.4 of the problem list and test its correct behaviour.

3.4. Prove that the function $add(x,y) = x + y, with\ x, y \in \mathbb{N}$ **is Turing-computable using the unary notation** $\{|\}$ **. You have to create a TM with two arguments separated by a blank symbol that stars and ends behind the stings.**



2 Define a recursive function for the sum of three values.

Se usa la funcion definida de adicción: el programa haría algo parecido a lo siguiente, es decir primero sumará los primeros dos elementos y luego al resultado que esto ofrezca, le suma el siguiente término:

$$suma3 = << \pi_1^3 | \sigma(\pi_2^3) > | \sigma(\pi_3^3) >$$

```
octave:5> evalrecfunction('addition(addition(π^3_1,π^3_2),π^3_3)',3,2,1)
addition(addition(π³₁,π³₂),π³₃)(3,2,1)
addition(π³₁,π³₂)(3,2,1)
π³₁(3,2,1) = 3

π³₂(3,2,1) = 2

addition(3,2)
<π¹₁|σ(π³₃)>(3,2)
<π¹₁|σ(π³₃)>(3,1)
<π¹₁|σ(π³₃)>(3,0)
π¹₁(3) = 3
σ(π³₃)(3,0,3)
π³₃(3,0,3) = 3

σ(3) = 4
σ(π³₃)(3,1,4)
π³₃(3,1,4) = 4

σ(4) = 5

π³₃(3,2,1) = 1

addition(5,1)
<π¹₁|σ(π³₃)>(5,1)
<π¹₁|σ(π³₃)>(5,0)
π¹₁(5) = 5
σ(π³₃)(5,0,5)
π³₃(5,0,5) = 5

σ(5) = 6
ans = 6
octave:6>
```

3 Implement a WHILE program that computes the sum of thre values. You must use an auxiliary variable that accumulates the result of the sum.

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