Evaluación semanal 3

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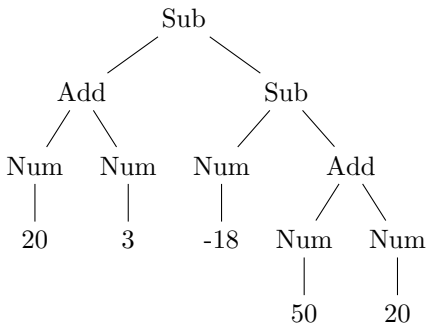
Ejercicio 1

$(-\ \ (+\ \ 20\ \ 3)(-\ \ -18\ \ (+\ \ 50\ \ 20)))$

1. **Sintaxix abstracta**



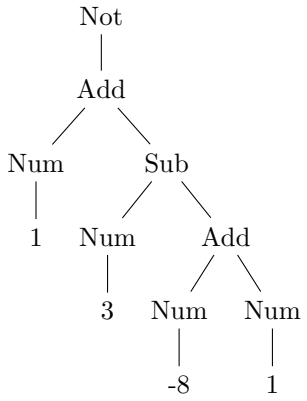
2. **Semántica natural**

$$\dfrac{\dfrac{\dfrac{\text{N(20)} \Rightarrow \text{N(20)} \qquad \text{N(3)} \Rightarrow \text{N(3)}}{\text{Add(N(20), N(3))} \Rightarrow \text{N(23)}} \qquad \dfrac{\text{N(-18)} \Rightarrow \text{N(-18)} \qquad \dfrac{\text{N(50)} \Rightarrow \text{N(50)} \qquad \text{N(20)} \Rightarrow \text{N(20)}}{\text{Add(N(50), N(20))} \Rightarrow \text{N(70)}}}{\text{Sub(N (-18), Add(N(50), N(20))} \Rightarrow \text{N(70))}}}{\text{Sub(Add(N(20), N(3)), Sub(N(-18), Add(N(50), N(20)))} \Rightarrow \text{N(111)}}$$

3. **Semántica estructural**
   $Sub(Add(Num(20), Num(3)), Sub(Num(-18), Add(Num(50), Num(20))))$
   $\rightarrow Sub(Num(23), Sub(Num(-18), Add(Num(50), Num(20))))$
   $\rightarrow Sub(Num(23), Sub(Num(-18), Num(70)))$
   $\rightarrow Sub(Num(23), Num(-88))$
   $\rightarrow Num(111)$

$(not(+\ \ 1(-\ \ 3(+\ \ -8\ \ 1))))$

1. **Sintaxix abstracta**



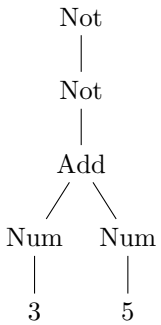
2. **Semántica natural**

$$\dfrac{\dfrac{Num(1) \Rightarrow Num(1) \qquad \dfrac{Num(3) \Rightarrow Num(3) \qquad \dfrac{Num(-8) \Rightarrow Num(-8) \qquad Num(1) \Rightarrow Num(1)}{Add(Num(-8), Num(1)) \Rightarrow Num(-7)}}{Sub(Num(3), Add(Num(-8), Num(1))) \Rightarrow Num(10)}}{Add(Num(1), Sub(Num(3), Add(Num(-8), Num(1)))) \Rightarrow Num(11)}}{Not(Add(Num(1), Sub(Num(3), Add(Num(-8), Num(1))))) \Rightarrow Boolean(false)}$$

3. **Semántica estructural**
   $Not(Add(Num(1), Sub(Num(3), Add(Num(-8), Num(1)))))$
   $\rightarrow Not(Add(Num(1), Sub(Num(3)Num(-7))))$
   $\rightarrow Not(Add((Num(1), Num(10))))$
   $\rightarrow Not(11)$
   $\rightarrow Boolean(false)$

$(not(not(+\ \ 3\ \ 5)))$

1. **Sintaxix abstracta**



2. **Semántica natural**

$$\dfrac{\dfrac{\dfrac{Num(3) \Rightarrow Num(3) \qquad Num(5) \Rightarrow Num(5)}{Add(Num(3), Num(5)) \Rightarrow Num(8)}}{Not(Add(Num(3), Num(5))) \Rightarrow Boolean(false)}}{Not(Not(Add(Num(3), Num(5)))) \Rightarrow Boolean(true)}$$

3. **Semántica estructural**
   $Not(Not(Add(Num(3), Num(5)))$
   $\rightarrow Not(Not(Num(8)))$
   $\rightarrow Not(Boolean(false))$
   $\rightarrow Boolean(true)$

Ejercicio 2

Gramática libre de contexto modificada

```
<S> ::= <E>
<E> ::= <Int> | <Bool> | <Float>
        | (+ <E> <E>) | (- <E> <E>)
        | (* <E> <E>) | (/ <E> <E>)
        | (Not <E>) | (add1 <E>) | (sub1 <E>)
        | (sqrt <E>)
<Int> ::= <N> | -<M>
<Bool> ::= #t | #f
<Float> ::= <Int>.{0}<M>
<D> ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
<N> ::= 0 | <D>{<N>}
<M> ::= <D>{<N>}
```

Reglas de sintaxis abstracta

Números

$$\frac{n \in \mathbb{R}}{\text{Num}(n)\ \text{ASA}}$$

Multiplicación

$$\frac{i\ \text{ASA} \qquad d\ \text{ASA}}{Mult(i,d)\ \text{ASA}}$$

División

$$\frac{i\ \text{ASA} \qquad d\ \text{ASA}}{Div(i,d)\ \text{ASA}}$$

Sumar uno

$$\frac{i\ \text{ASA}}{Add1(i)\ \text{ASA}}$$

Restar uno

$$\frac{i\ \text{ASA}}{Sub1(i)\ \text{ASA}}$$

Raíz cuadrada

$$\frac{i\ \text{ASA}}{Sqrt(i)\ \text{ASA}}$$

Reglas de semántica natural y estructural

Natural

Multiplicación

$$\frac{\text{i} \Rightarrow \text{Num}(n_1) \qquad \text{d} \Rightarrow \text{Num}(n_2)}{\text{Mult(i,d)} \Rightarrow \text{Num}(n_1 * n_2)}$$

División

$$\frac{\text{i} \Rightarrow \text{Num}(n_1) \qquad \text{d} \Rightarrow \text{Num}(0)}{\text{Div(i,d)} \Rightarrow \text{'error: División entre cero'}}$$

$$\frac{\text{i} \Rightarrow \text{Num}(n_1) \qquad \text{d} \Rightarrow \text{Num}(n_2)}{\text{Div(i,d)} \Rightarrow \text{Num}(n_1 / n_2)}$$

Sumar uno

$$\frac{\text{i} \Rightarrow \text{Num}(n_1)}{\text{Add1(i)} \Rightarrow \text{Num}(n_1 + 1)}$$

Restar uno

$$\frac{\text{i} \Rightarrow \text{Num}(n_1)}{\text{Sub1(i,d)} \Rightarrow \text{Num}(n_1 - 1)}$$

Raíz Cuadrada

$$\frac{\text{i} \Rightarrow \text{Num}(n) \qquad n \in \mathbb{R}^-}{\text{Sqrt(i)} \Rightarrow \text{'error: Raíz negativa'}}$$

$$\frac{\text{i} \Rightarrow \text{Num}(n_1)}{\text{Sqrt(i)} \Rightarrow \text{Num}(\sqrt{n_1})}$$

Estructural

Multiplicación

- Caso 1

$$\frac{i \to i'}{Mult(i,d) \to Mult(i',d)}$$

- Caso 2

$$\frac{d \to d'}{Mult(Num(n),d) \to Mult(Num(n),d')}$$

- Caso 3

$$\frac{}{Mult(Num(n_1),Num(n_2)) \to Num(n_1 * n_2)}$$

División

- Caso 1

$$\frac{\text{i} \to \text{i'}}{\text{Div(i,d)} \to \text{Div(i',d)}}$$

- Caso 2

$$\frac{\text{d} \rightarrow \text{d'}}{\text{Div(Num}(n_1)\text{,d)} \rightarrow \text{Div(Num}(n_1)\text{,d')}}$$

- Caso 3

$$\frac{}{\text{Div(Num(n), Num(0))} \Rightarrow \text{'error: División entre cero'}}$$

- Caso 4

$$\frac{n_2 \in \mathbb{R} - \{0\}}{\text{Div(Num}(n_1)\text{, Num}(n_2)) \rightarrow \text{Num}(n_1/n_2)}$$

Sumar uno

- Caso 1

$$\frac{i \rightarrow i'}{Add1(i) \rightarrow Add1(i')}$$

- Caso 2

$$\frac{}{Add1(Num(n_1)) \rightarrow Num(n_1 + 1)}$$

Restar uno

- Caso 1

$$\frac{i \rightarrow i'}{Sub1(i) \rightarrow Sub1(i')}$$

- Caso 2

$$\frac{}{Sub1(Num(n_1)) \rightarrow Num(n_1 - 1)}$$

Raíz cuadrada

- Caso 1

$$\frac{i \rightarrow i'}{Sqrt(i) \rightarrow Sqrt(i')}$$

- caso 2

$$\frac{n_1 \in \mathbb{R}^-}{Sqrt(Num(n_1)) \rightarrow \text{'error: Raíz negativa'}}$$

- Caso 3

$$\frac{n_1 \in \mathbb{R}^+ \cup \{0\}}{Sqrt(Num(n_1)) \rightarrow Num(\sqrt{n_1})}$$