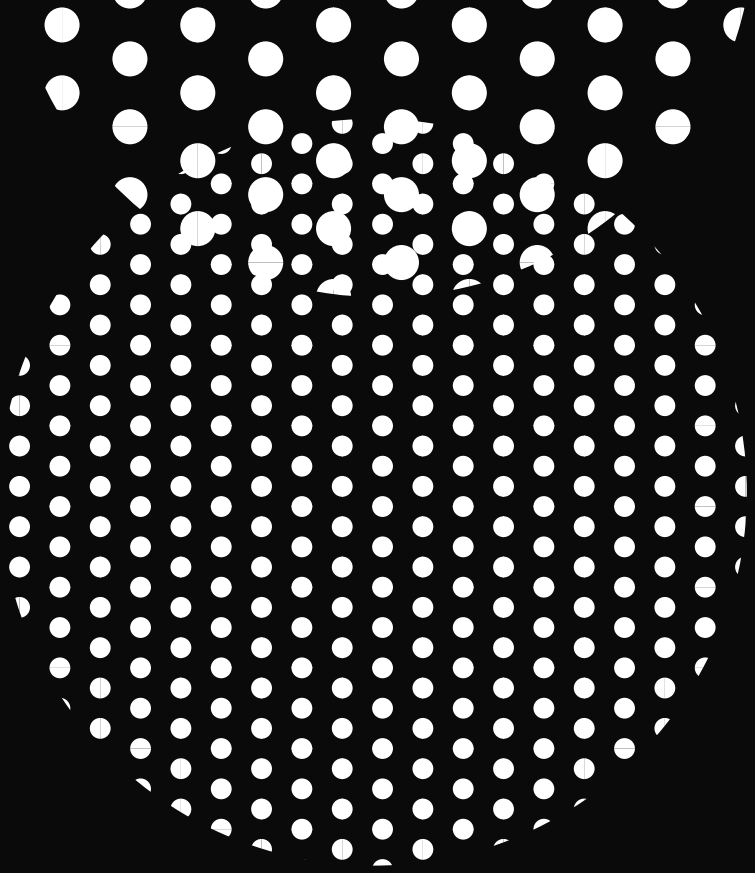

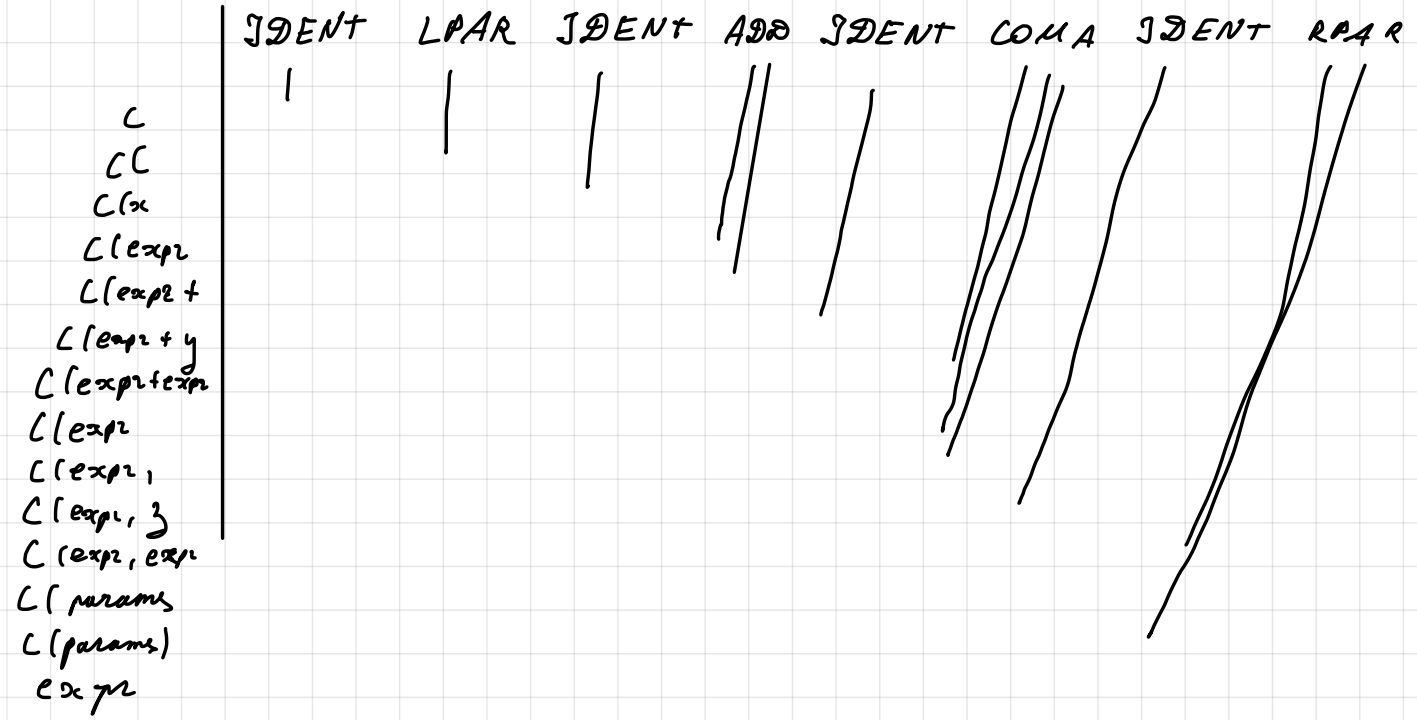

4.

$$\frac{\Gamma(c) = T}{\Gamma \vdash c : T_1} \qquad \frac{\Gamma(\text{Leaf}) = \text{int} \to \text{bfree} \quad \Gamma \vdash e : T_2}{\Gamma \vdash \text{Leaf}(n) \to e : T_1 \to T_2} \qquad \frac{(x)}{\Gamma \vdash \text{Node}(t_1, t_2) \to \text{Node}(t_2, t_1) : T_1 \to T_2}$$

$$\Gamma \vdash \text{match } c \text{ with } \text{Leaf}(n) \to e \mid \text{Node}(t_1, t_2) \to \text{Node}(t_2, t_1) : T_2$$

$$(x) = \Gamma(\text{Node}) = \text{bfree} \times \text{bfree} \to \overset{T_1}{\text{bfree}}$$

$$\frac{\Gamma(\text{Node}) = \text{bfree} \times \text{bfree} \to \overset{T_2}{\text{bfree}} \quad \Gamma \vdash t_2 : \text{bfree} \quad \Gamma \vdash t_1 : \text{bfree}}{\Gamma \vdash \text{Node}(t_2, t_1) : T_2}$$