

Lecture 09/06: Normal vs Applicative Order

- Normal:** left-most redex first.
best behaved regarding termination.
- Applicative:** evaluate argument to a value before β -red.
best behaved regarding efficiency.

e.g.:

$$f(x) = x * x$$

$$g(y, z) = y + z$$

$$\begin{aligned}
 & f(g(2, 3)) \\
 & \rightarrow g(2, 3) * g(2, 3) \\
 & \rightarrow (2+3) * (2+3)
 \end{aligned}
 \left. \vphantom{\begin{aligned} & f(g(2, 3)) \\ & \rightarrow g(2, 3) * g(2, 3) \\ & \rightarrow (2+3) * (2+3) \end{aligned}} \right\} \begin{array}{l} \text{NORMAL} \\ \text{LAMBDA} \end{array}$$

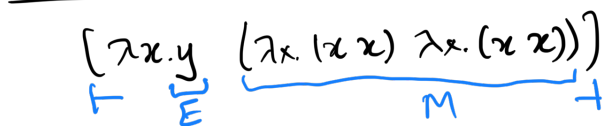
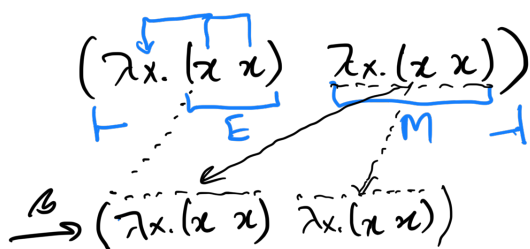
$$\begin{aligned}
 & f(g(2, 3)) \\
 & \rightarrow f(2+3) \\
 & \rightarrow f(5) \rightarrow 5 * 5
 \end{aligned}
 \left. \vphantom{\begin{aligned} & f(g(2, 3)) \\ & \rightarrow f(2+3) \\ & \rightarrow f(5) \rightarrow 5 * 5 \end{aligned}} \right\} \begin{array}{l} \text{APPLICATIVE} \\ \text{LAMBDA} \end{array}$$

$$f(x) = 5$$

$$\text{loop}() = \text{loop}()$$

$$f(\text{loop}()) \rightarrow 5 \quad \left. \vphantom{f(\text{loop}())} \right\} \text{Normal}$$

$$\rightarrow f(\text{loop}()) \dots \left. \vphantom{\rightarrow f(\text{loop}())} \right\} \text{Applicative}$$



$$\rightarrow y \quad \left. \vphantom{\rightarrow y} \right\} \text{NORMAL}$$