Programming paradigms 1

Evaluation: if + define

Miroslav Hruška

Outline

if

$\mathrm{Eval}[\texttt{if}, \mathcal{P}_{\mathrm{G}}] = \text{'special form if'}$

Outline

(if (< 0 1) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{<}\ \texttt{0}\ \texttt{1})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

(if (< 0 1) 1 2)

Eval[(`if` (`<` `0` `1`) `1` `2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

(if (< 0 1) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{<}\ \texttt{0}\ \texttt{1})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Eval}[\texttt{<}, \mathcal{P}_{\text{G}}] = \text{'pr. proc. less than'}$

$\text{Eval}[\texttt{0}, \mathcal{P}_{\text{G}}] = \texttt{0}$

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$\text{'\#t'} \neq \text{'\#f'}$

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$\text{'\#t'} \neq \text{'\#f'}$

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Outline

(if 0 1 2)

$\mathsf{Eval}[(\texttt{if 0 1 2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

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$0 \neq \text{'\#f'}$

$\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

Outline

(if (+) 1 2)

Eval[(`if` (`+`) `1` `2`), $\mathcal{P}_{\mathrm{G}}$] = ...

(if (+) 1 2)

$$\text{Eval}[(\texttt{if}\ (+)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$$

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Outline

(if (+ x) 1 2)

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$\text{Eval}[\texttt{+}, \mathcal{P}_{\text{G}}] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\texttt{x}, \mathcal{P}_{\text{G}}] = \ldots$

Error: Symbol 'x' does not have binding.

Outline

(if + 1 2)

$\mathsf{Eval}[(\texttt{if + 1 2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

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$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] =$ 'special form if'

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$\text{'pr. proc. of sum.'} \neq \text{'\#f'}$

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$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{+}, \texttt{1}, \texttt{2}] = \ldots$

$\text{Eval}[\texttt{+}, \mathcal{P}_{\text{G}}] = \text{'pr. proc. of sum.'}$

$\text{'pr. proc. of sum.'} \neq \text{'\#f'}$

$\text{Eval}[\texttt{1}, \mathcal{P}_{\text{G}}] = \texttt{1}$

Outline

(if x 1 2)

$\mathsf{Eval}[(\texttt{if x 1 2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{x}, 1, 2] = \ldots$

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$\text{Eval}[(\texttt{if x 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{x}, 1, 2] = \ldots$

$\quad \text{Eval}[\texttt{x}, \mathcal{P}_{\text{G}}] = \ldots$

(if x 1 2)

Eval[(`if x 1 2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', `x`, `1`, `2`] = ...

Eval[`x`, $\mathcal{P}_{\mathrm{G}}$] = ...

Error: Symbol '`x`' does not have binding.

Outline

(if 1 x 2)

$\mathsf{Eval}[(\texttt{if 1 x 2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, 1, \texttt{x}, 2] = \ldots$

$\quad \text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

$\quad 1 \neq \text{'\#f'}$

(if 1 x 2)

$\text{Eval}[(\texttt{if 1 x 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{1}, \texttt{x}, \texttt{2}] = \ldots$

$\text{Eval}[\texttt{1}, \mathcal{P}_{\text{G}}] = \texttt{1}$

$\texttt{1} \neq \text{'\#f'}$

$\text{Eval}[\texttt{x}, \mathcal{P}_{\text{G}}] = \ldots$

(if 1 x 2)

Eval[(`if 1 x 2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', `1`, `x`, `2`] = ...

Eval[`1`, $\mathcal{P}_{\mathrm{G}}$] = `1`

`1` $\neq$ '#f'

Eval[`x`, $\mathcal{P}_{\mathrm{G}}$] = ...

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Outline

(if 1 2 x)

$\mathsf{Eval}[(\texttt{if 1 2 x}), \mathcal{P}_{\mathrm{G}}] = \ldots$

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$\text{Eval}[(\texttt{if 1 2 x}), \mathcal{P}_{\text{G}}] = \ldots$

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(if 1 2 x)

$\text{Eval}[(\texttt{if 1 2 x}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{1}, \texttt{2}, \texttt{x}] = \ldots$

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$\text{Eval}[(\texttt{if 1 2 x}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{1}, \texttt{2}, \texttt{x}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{1}, \texttt{2}, \texttt{x}] = \ldots$

$\text{Eval}[\texttt{1}, \mathcal{P}_{\text{G}}] = \texttt{1}$

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(if 1 2 x)

$\text{Eval}[(\texttt{if 1 2 x}), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, 1, 2, \texttt{x}] = \ldots$

$\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

$1 \neq \text{'\#f'}$

$\text{Eval}[2, \mathcal{P}_{\text{G}}] = 2$

Outline

(if define 1 2)

Eval[(`if define 1 2`), $\mathcal{P}_{\mathrm{G}}$] = ...

(if define 1 2)

$\text{Eval}[(\texttt{if define 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] =$ 'special form if'

(if define 1 2)

$$\text{Eval}[(\texttt{if define 1 2}), \mathcal{P}_{\text{G}}] = \ldots$$

$$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$$

$$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{define}, 1, 2] = \ldots$$

(if define 1 2)

$\text{Eval}[(\texttt{if define 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{define}, 1, 2] = \ldots$

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(if define 1 2)

Eval[(`if define 1 2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', `define`, `1`, `2`] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

'special form define' $\neq$ '#f'

(if define 1 2)

$\text{Eval}[(\texttt{if define 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{define}, 1, 2] = \ldots$

$\text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\text{'special form define'} \neq \text{'\#f'}$

$\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

Outline

(if if 1 2)

$\mathsf{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

(if if 1 2)

$$\text{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\text{G}}] = \ldots$$

$$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$$

(if if 1 2)

$\text{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, \texttt{if}, 1, 2] = \ldots$

(if if 1 2)

$\text{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

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$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

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$\text{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Eval}[(\texttt{if if 1 2}), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{'special form if'} \neq \text{'\#f'}$

$\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

Outline

(if (define) 1 2)

$\mathrm{Eval}[(\texttt{if}\ (\texttt{define})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

(if (define) 1 2)

$$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\mathrm{G}}] = \ldots$$

$$\text{Eval}[\texttt{if}, \mathcal{P}_{\mathrm{G}}] = \text{'special form if'}$$

(if (define) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}), 1, 2] = \ldots$

(if (define) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}), 1, 2] = \ldots$

$\quad \text{Eval}[(\texttt{define}), \mathcal{P}_{\text{G}}] = \ldots$

(if (define) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}), 1, 2] = \ldots$

$\quad \text{Eval}[(\texttt{define}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad\quad \text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

(if (define) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}), 1, 2] = \ldots$

$\quad \text{Eval}[(\texttt{define}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad\quad \text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\quad \text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'},] = \ldots$

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$\text{Eval}[(\texttt{if}\ (\texttt{define})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}), 1, 2] = \ldots$

$\quad \text{Eval}[(\texttt{define}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad\quad \text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\quad \text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'},] = \ldots$

$\quad\quad$ **Error:** define: Incorrect number of arguments

Outline

(if (define x) 1 2)

Eval[(`if (define x) 1 2`), $\mathcal{P}_{\mathrm{G}}$] = ...

(if (define x) 1 2)

$$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\mathrm{G}}] = \ldots$$

$$\text{Eval}[\texttt{if}, \mathcal{P}_{\mathrm{G}}] = \text{'special form if'}$$

(if (define x) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}), 1, 2] = \ldots$

(if (define x) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

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$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}), 1, 2] = \ldots$

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$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

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$\quad \text{Eval}[(\texttt{define}\ \texttt{x}), \mathcal{P}_{\text{G}}] = \ldots$

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(if (define x) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\quad \text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}), 1, 2] = \ldots$

$\quad \text{Eval}[(\texttt{define}\ \texttt{x}), \mathcal{P}_{\text{G}}] = \ldots$

$\quad\quad \text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\quad \text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'}, \texttt{x}] = \ldots$

(if (define x) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x})\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}), 1, 2] = \ldots$

$\text{Eval}[(\texttt{define}\ \texttt{x}), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'}, \texttt{x}] = \ldots$

Error: define: Incorrect number of arguments

Outline

(if (define x 0) 1 2)

$\mathsf{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ \texttt{0})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\mathrm{G}}] = \ldots$

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ \texttt{0})\ \texttt{1}\ \texttt{2}), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ 0)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}\ 0), 1, 2] = \ldots$

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ 0)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}\ 0), 1, 2] = \ldots$

$\text{Eval}[(\texttt{define}\ \texttt{x}\ 0), \mathcal{P}_{\text{G}}] = \ldots$

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ 0)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}\ 0), 1, 2] = \ldots$

$\text{Eval}[(\texttt{define}\ \texttt{x}\ 0), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ 0)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}\ 0), 1, 2] = \ldots$

$\text{Eval}[(\texttt{define}\ \texttt{x}\ 0), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'}, \texttt{x}, 0] = \ldots$

(if (define x 0) 1 2)

Eval[(`if` (`define` `x` `0`) `1` `2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', (`define` `x` `0`), `1`, `2`] = ...

Eval[(`define` `x` `0`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form define', `x`, `0`] = ...

✓ `x` is a symbol.

(if (define x 0) 1 2)

Eval[(`if` (`define` `x` 0) `1` `2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', (`define` `x` 0), `1`, `2`] = ...

Eval[(`define` `x` 0), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form define', `x`, 0] = ...

✓ `x` is a symbol.

Eval[0, $\mathcal{P}_{\mathrm{G}}$] = 0

(if (define x 0) 1 2)

Eval[(`if` (`define` `x` 0) 1 2), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', (`define` `x` 0), 1, 2] = ...

Eval[(`define` `x` 0), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form define', `x`, 0] = ...

✓ `x` is a symbol.

Eval[0, $\mathcal{P}_{\mathrm{G}}$] = 0

`x` $\mapsto_{\mathcal{P}_{\mathrm{G}}}$ 0

(if (define x 0) 1 2)

$\text{Eval}[(\texttt{if}\ (\texttt{define}\ \texttt{x}\ 0)\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{if}, \mathcal{P}_{\text{G}}] = \text{'special form if'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form if'}, (\texttt{define}\ \texttt{x}\ 0), 1, 2] = \ldots$

$\text{Eval}[(\texttt{define}\ \texttt{x}\ 0), \mathcal{P}_{\text{G}}] = \ldots$

$\text{Eval}[\texttt{define}, \mathcal{P}_{\text{G}}] = \text{'special form define'}$

$\text{Apply}_{\mathcal{P}_{\text{G}}}[\text{'special form define'}, \texttt{x}, 0] = \ldots$

✓ $\texttt{x}$ is a symbol.

$\text{Eval}[0, \mathcal{P}_{\text{G}}] = 0$

$\texttt{x} \mapsto_{\mathcal{P}_{\text{G}}} 0$

$= \text{'undefined'}$

(if (define x 0) 1 2)

Eval[(`if` (`define` `x` 0) 1 2), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', (`define` `x` 0), 1, 2] = ...

Eval[(`define` `x` 0), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form define', `x`, 0] = ...

✓ `x` is a symbol.

Eval[0, $\mathcal{P}_{\mathrm{G}}$] = 0

`x` $\mapsto_{\mathcal{P}_{\mathrm{G}}}$ 0

= 'undefined'

'undefined' $\neq$ '#f'

(if (define x 0) 1 2)

Eval[(`if` (`define` `x` `0`) `1` `2`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`if`, $\mathcal{P}_{\mathrm{G}}$] = 'special form if'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form if', (`define` `x` `0`), `1`, `2`] = ...

Eval[(`define` `x` `0`), $\mathcal{P}_{\mathrm{G}}$] = ...

Eval[`define`, $\mathcal{P}_{\mathrm{G}}$] = 'special form define'

Apply$_{\mathcal{P}_{\mathrm{G}}}$['special form define', `x`, `0`] = ...

✓ `x` is a symbol.

Eval[`0`, $\mathcal{P}_{\mathrm{G}}$] = `0`

`x` $\mapsto_{\mathcal{P}_{\mathrm{G}}}$ `0`

= 'undefined'

'undefined' $\neq$ '#f'

Eval[`1`, $\mathcal{P}_{\mathrm{G}}$] = `1`