

Tutorial 1: Solutions

CS 135 Fall 2007

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3 Simple Functions in Scheme

3.1 Scheme notation vs. Mathematical notation

From Scheme to Math:

- `(define (f x) (- (* 5 x) 4))` $\Rightarrow f(x) = 5x - 4$
- `(define (g x) (- (/ (* (+ x 2) (- x 3)) 5) x))` $\Rightarrow g(x) = x(x+2)(x-3)/5$

From Math to Scheme:

- $f(x) = (x + 5)/(8x - 9) \Rightarrow$ `(define (f x) (/ (+ x 5) (- (* 8 x) 9)))`
- $g(x, y) = (xy - 7)(x + y) - (3x + 5y - 12)$
 \Rightarrow `(define (g x y) (- (* (- (* x y) 7) (+ x y)) (+ (* 3 x) (- (* 5 y) 12))))`

3.2 Function Evaluation

Note the following steps are to illustrate the intermediate results only and do not necessarily follow the exact order of the evaluation steps performed by DrScheme.

- `(- (* 4 5) (/ 6 3))`
 $\Rightarrow (- 20 2)$
 $\Rightarrow 18$

- $(/ (+ 2 (- 5 2) (* 3 3)) (/ (- (* 5 5) 4) 3))$
 $\Rightarrow (/ (+ 2 3 9) (/ (- 25 4) 3))$
 $\Rightarrow (/ 14 (/ 21 3))$
 $\Rightarrow 2$
- $(define (f x) (* x (+ x 1)))$
 $(+ (f 1) (/ (f 2) 3))$
 $\Rightarrow (+ (* 1 (+ 1 1)) (/ (* 2 (+ 2 1)) 3))$
 $\Rightarrow (+ 2 (/ 6 3))$
 $\Rightarrow 4$
- $(define (f x) (- x 1))$
 $(define (g x) (* x (f (/ x 3)) 2))$
 $(/ (g (g 6)) 2)$
 $\Rightarrow (/ (g (* 6 (f (/ 6 3)) 2)) 2)$
 $\Rightarrow (/ (g (* 6 (f 2) 2)) 2)$
 $\Rightarrow (/ (g (* 6 (- 2 1) 2)) 2)$
 $\Rightarrow (/ (g 12) 2)$
 $\Rightarrow (/ (* 12 (f (/ 12 3)) 2) 2)$
 $\Rightarrow (/ (* 12 (- 4 1) 2) 2)$
 $\Rightarrow (/ 72 2)$
 $\Rightarrow 36$