**Exercise 11**: Use *only* **first**, **rest**, and **cons.**

**(define a '())**

**(define b '(()()()))**

**(define c '(Bob (Jane)))**

**(define d '(((Bob)(Jane))))**

**(define e 'Jane)**

**(define f '((Bob)Jane))**

**Section A.** Given the following definitions:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Replacement** | **Note:**  You are defining **Jane** as an **atom**;  therefore **e** will be equal to **Jane**, *not* **(Jane)** |
| **a** | ( ) |
| **b** | ( ( ) ( ) ( ) ) |
| **c** | (Bob (Jane) ) |
| **d** | ( ( (Bob) (Jane) ) ) |
| **e** | Jane |
| **f** | ( (Bob) Jane) |

Evaluate the following expressions and write your answer in the appropriate space. If the expression cannot be evaluated, write “Cannot be evaluated”.

|  |  |
| --- | --- |
| (first a) | Cannot be evaluated. |
| (first b) | ‘ () |
| (first c) | ‘Bob |
| (first d) | ‘( (Bob) (Jane)) |
| (first e) | Cannot be evaluated. |
| (rest f) | ‘(Jane) |
| (rest c) | ‘((Jane)) |
| (rest d) | ‘() |
| (rest f) | ‘(Jane) |
| (cons a c) | ‘(() Bob (Jane)) |
| (cons a d) | ‘(() ((Bob) (Jane))) |
| (cons a e) | Cannot be evaluated. |
| (cons f c) | ‘(((Bob) Jane) Bob (Jane)) |
| (cons e d) | ‘(Jane ((Bob) (Jane))) |
| (cons a (rest c)) | ‘(() (Jane)) |
| (cons e (rest f)) | ‘(Jane Jane) |
| (cons f (rest a)) | Cannot be evaluated. |
| (cons a (rest b)) | ‘(() () ()) |
| (first (rest f)) | ‘Jane |
| (first (rest (first d))) | ‘(Jane) |
| (first (rest (cons a f))) | ‘(Bob) |
| (rest (rest d)) | Cannot be evaluated |
| (first (rest f)) | ‘Jane |

**Section B.** Given the following definitions:

|  |  |
| --- | --- |
| **Variable** | **Replacement** |
| **a** | (5 4 3 2 1) |
| **b** | ( (5) ( (4) (3) 3 ( (2) ) ) ) |
| **c** | (5 (4 (3 (2 (1) ) ) ) ) |
| **x** | (a b c (d) e f) |
| **y** | ((5) ((4 3) 2 (1))) |

Write an expression that will output the following:

|  |  |  |
| --- | --- | --- |
| **Using…** | **Output should be…** | **What is the expression?** |
| List **a** | '(4 3 2 1) | (rest a) |
| '(3 2 1) | (rest (rest a)) |
| 4 | (first (rest a)) |
| List **b** | '((4) (3) 3 ((2))) | (first (rest b)) |
| '((3) 3 ((2))) | (rest (first (rest b))) |
| '() | (rest (rest (rest (rest (first (rest b)))))) |
| List **c** | '(4 (3 (2 (1)))) | (first (rest c)) |
| 5 | (first c) |
| '((3 (2 (1)))) | (rest (first (rest c))) |
| List **x** and **y** | '(a 5) | (cons (first x) (first y)) |
| '(b ((4 3) 2 (1))) | (cons (first (rest x)) (rest y)) |
| '((5) a b c (d) e f) | (cons (first y) x) |

**Due date:** Today by the end of class.

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