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Q1: List Equality

a. (2 marks) `[W, X, Y | Z]` and `[1, 2, 3, 4, 5 | [6, 7, X] ]`

LHS: $[W, X, Y \mid Z]$ = RHS: $[1, 2, 3, 4, 5, 6, 7, X]$

$W = 1$
$X = 2$
$Y = 3$
$Z = [4, 5, 6, 7, 2]$

match

b. (2 marks) `[p | [q | [ r | [s | [ t | [V] ] ] ] ] ]` and `[X, Y| Z]`.

LHS: $[p \mid [q \mid [r \mid [s \mid [t \mid [V]]]]]]$ = RHS: $[X, Y \mid Z]$

$[p, q, r, s, t, V] = [X, Y \mid Z]$

$X = p$
$Y = q$
$Z = [r, s, t, V]$
$V = V$

match

c. (2 marks) `[ [Z | [x, y] ], e, f, g ]` and `[ [a, [x, y] ] | V]`

LHS: $[[Z \mid [x, y]], e, f, g]$ ≠ RHS: $[[a, [x, y]] \mid V]$

$[[Z, x, y], e, f, g] \neq [[a, [x, y] \mid V]$

$[Z, x, y] \neq [a, [x, y]]$

Not a match because the first element on LHS contains a list with 3 elements whereas on RHS, the first element contains 2 elements, hence cannot equal LHS.

d. (2 marks) `[ [a], B, C | D]` and `[ [a | [B] ] | [C | D] ]`

LHS: $[[a], B, C \mid D]$ ≠ RHS: $[a, [B], C \mid D]$

$[a] \neq a$
$B \neq [B]$

Part d Explanation: Not a match because the first element in LHS is a list containing "a" whereas in RHS, it's a single element. Second element in LHS is a variable whereas in RHS, it's a list containing a singleton variable.

e. (3 marks) `[minus | [Y, X | [ minus, Y | [X] ] ] ]` and `[X, plus, minus | [X, Y, minus] ]`

[minus, Y, X, minus, Y, X] = [X, plus, minus, X, Y, minus]

match

X = minus
Y = plus

f. (3 marks) `[bike | A]` and `[C | [C | [C | [C | [C] ] ] ] ]`

[bike | A] = [C, C, C, C, C]

match

C = bike
A = [bike, bike, bike, bike]

g. (3 marks) `[a, b | [ C | [ D, E | C] ] ]` and `[F | [G, H, [], [ [D] ] ] ]`

[a, b, C, D, E | C] = [F, G, H, [], [[D]]]

match

F = a
G = b
H = []
D = []
E = [[]]
C = []

h. (3 marks) `[Fox, [[in], socks], [on], box, on | [[knox]] ]` and `[[The, cat], [[in], The], Hat | [Comes | Back] ]`

[Fox, [in], socks], [on], box, on, [knox]] = [[The, cat], [[in], The], Hat, Comes | Back]

match

Fox = [The, cat]
Fox = [socks, cat]
[[in], socks] = [[in], The]
The = socks
Hat = [on]
Comes = box
Back = [on, [knox]]