

Duke Nguyen (duc1.nguyen@torontomu.ca / 501140042)

Zehra Cengiz (zehra.cengiz@torontomu.ca / 501185527)

Simon Aleksandrov (simon.aleksandrov@torontomu.ca / 501162745)

1. List Equality [20 marks]

a. (2 marks)  $[X, Y \mid Z]$  and  $[a, b, c \mid [d, e, Y]]$  can be made identical.

$[a, b, c \mid [d, e, Y]] = [a, b, c, d, e, Y] = [a, b \mid [c, d, e, Y]]$

$[X, Y \mid Z]$  and  $[a, b \mid [c, d, e, Y]]$  match on:

$X = a$

$Y = b$

$Z = [c, d, e, b]$

b. (2 marks)  $[q, [A \mid [r, s]], t]$  and  $[q, [r, [r, s]] \mid B]$  cannot be made identical.

$[q, [A \mid [r, s]], t] = [q, [A, r, s] \mid [t]]$

$[q, [A, r, s] \mid [t]]$  does not match with  $[q, [r, [r, s]] \mid B]$  because:

$q = q$

$A = r$

$r$  cannot match with  $[r, s]$

c. (2 marks)  $[ [Cow \mid [cat, dog]], bird, bug, chicken ]$  and  $[ [ant, [cat, dog]] \mid Horse]$  cannot be made identical.

$[ [Cow \mid [cat, dog]], bird, bug, chicken ] = [ [Cow, cat, dog], bird, bug, chicken ]$

$[ [Cow, cat, dog], bird, bug, chicken ]$  does not match with  $[ [ant, [cat, dog]] \mid Horse]$  because:

$Cow = ant$

$cat$  cannot match with  $[cat, dog]$

d. (2 marks)  $[1, A, 2 \mid [A, 3, 4]]$  and  $[B \mid [2, C \mid [D \mid E]]]$  can be made identical.

$[1, A, 2 \mid [A, 3, 4]] = [1, A, 2, A, 3, 4] = [1, A, 2, A \mid [3, 4]]$

$[B \mid [2, C \mid [D \mid E]]] = [B \mid [2, C, D \mid E]] = [B, 2, C, D \mid E]$

$[1, A, 2, A \mid [3, 4]]$  and  $[B, 2, C, D \mid E]$  match on:

$B = 1$

$A = 2$

$C = 2$

$D = 2$

$E = [3, 4]$

e. (3 marks)  $[A \mid [A \mid [[A \mid [A]]]]]$  and  $[b \mid C]$  can be made identical.

$[A \mid [A \mid [[A \mid [A]]]]] = [A \mid [A, [A]]]$

$[A \mid [A, [A]]]$  and  $[b \mid C]$  match on:

$A = b$

$C = [A, [A, [A]]] = [b, [b, [b]]]$

f. (3 marks)  $[X \mid [Y \mid [Z \mid [X]]]]$  and  $[all, around, the, world, Y]$  cannot be made identical.

$[X \mid [Y \mid [Z \mid [X]]]] = [X \mid [Y \mid [Z, X]]] = [X \mid [Y, Z, X]] = [X, Y, Z, X]$

$[all, around, the, world, Y]$  does not match  $[X, Y, Z, X]$  because:

$X = all$

$Y = around$

$Z = the$

$(X = world)$  failed

g. (3 marks)  $[1, 2 \mid [X \mid [Y, Z \mid X]]]$  and  $[Q \mid [R, S, [], [Y]]]$  can be made identical.

$[1, 2 \mid [X \mid [Y, Z \mid X]]] = [1, 2 \mid [X, Y, Z \mid X]] = [1, 2, X, Y, Z \mid X]$

$[Q \mid [R, S, [], [Y]]] = [Q, R, S, [], [Y]] = [Q, R, S, [], [Y]] \mid []$

$[1, 2, X, Y, Z \mid X]$  and  $[Q, R, S, [], [Y]] \mid []$  match on:

$Q = 1$

$R = 2$

$S = X$

$Y = []$

$Z = [[Y]] = [[]]$

$X = []$

$S = X = []$

h. (3 marks)  $[Lions, [[and], tigers], [and], bears, oh \mid [[my]]]$  and  $[[I, have], [[A], Bad], Feeling \mid [About \mid This]]$  can be made identical.

$[Lions, [[and], tigers], [and], bears, oh \mid [[my]]] = [Lions, [[and], tigers], [and], bears, oh, [my]] = [Lions, [[and], tigers], [and], bears \mid [oh, [my]]]$

$[[I, have], [[A], Bad], Feeling \mid [About \mid This]] = [[I, have], [[A], Bad], Feeling, About \mid This]$

$[Lions, [[and], tigers], [and], bears \mid [oh, [my]]]$  and  $[[I, have], [[A], Bad], Feeling, About \mid This]$  match on:

$Lions = [I, have]$

$I = I$

$A = and$

$Bad = tigers$

$Feeling = [and]$

$About = bears$

$This = [oh, [my]]$