

2020 students: I only found these partial answers

3.2

$$q(f(X), g(f(Y)), f(Z)) = q(f(f(Y)), g(f(a)), f(g(Y))).$$

$$X = f(a)$$

$$Y = a$$

$$Z = g(a)$$

3.2.2

$$p(g(f(X)), h(f(f(a)), Y)) = p(g(Y), h(Y, f(X))).$$

$$X = f(Z)$$

$$Y = f(f(Z))$$

3.3

$$q(X, a).$$

$$X = [a]$$

$$q(X, Y).$$

$$X = [_1]$$

$$Y = _1$$

$$q(f([Y]), f(X)).$$

no

$$q([f(Y)], f(X)).$$

$$Y = _1$$

$$X = _1$$

$$q([f(Y)], f(g(X))).$$

$$Y = g(_1)$$

$$X = _1$$

$$X = [a|Y], \quad r(X) = r([Z, b]).$$

$$X = [a, b]$$

$$Y = [b]$$

$$Z = a$$

4.1

s(5,X).
X = 5

s(a(5,20),X).
X = 25

s(a(Y,20),X).
loop

Y=20, s(m(5,a(Y,5)),X).
Y = 20
X = 125

s(a(5,m(6,3),20),X).
no

Y=5,Z=1,s(a(a(Z,m(6,3)),m(Z,Y)),X).
Y = 5
Z = 1
X = 24

Y=5,s(a(a(Z,m(6,3)),m(Z,Y)),X),Z=1.
loop

4.2

s2(5,X).
X = 5

s2(a(5,20),X).
X = 5+20

s2(a(Y,20),X).
loop

Y=20, s2(m(5,a(Y,5)),X).
Y = 20
X = 5*(20+5)

s2(a(5,m(6,3),20),X).
no

Y=5,Z=1,s2(a(a(Z,m(6,3)),m(Z,Y)),X).
Y = 5
Z = 1
X = 1+6*3+1*5

Y=5,s2(a(a(Z,m(6,3)),m(Z,Y)),X),Z=1.
loop

4.3

4.3: 4.2.3 modified:

`s2(a(Y,20),X).`

`Y = _1`
`X = _1+20`

4.3: 4.2.7 modified:

`Y = 5`
`Z = 1`
`X = 1+6*3+1*5`

4.4 in .3 and .7, “is” would fail because can’t eval variable