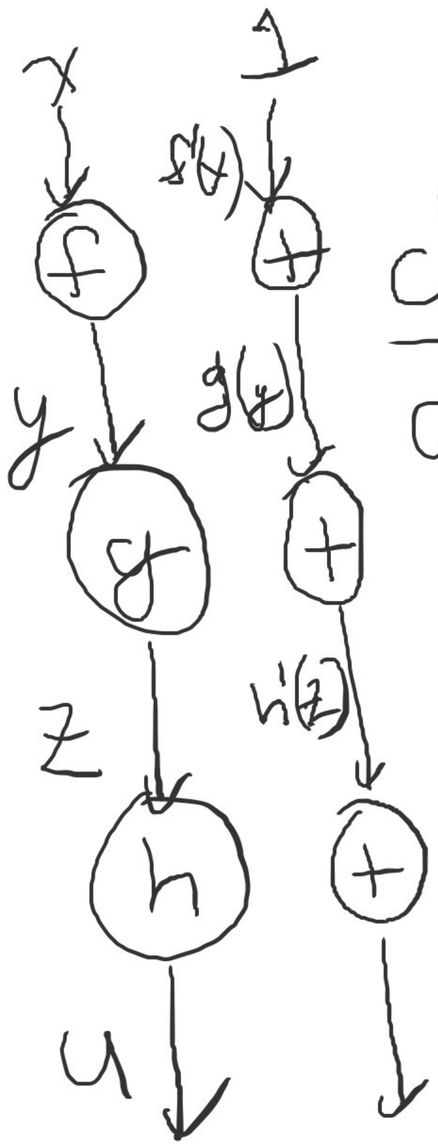
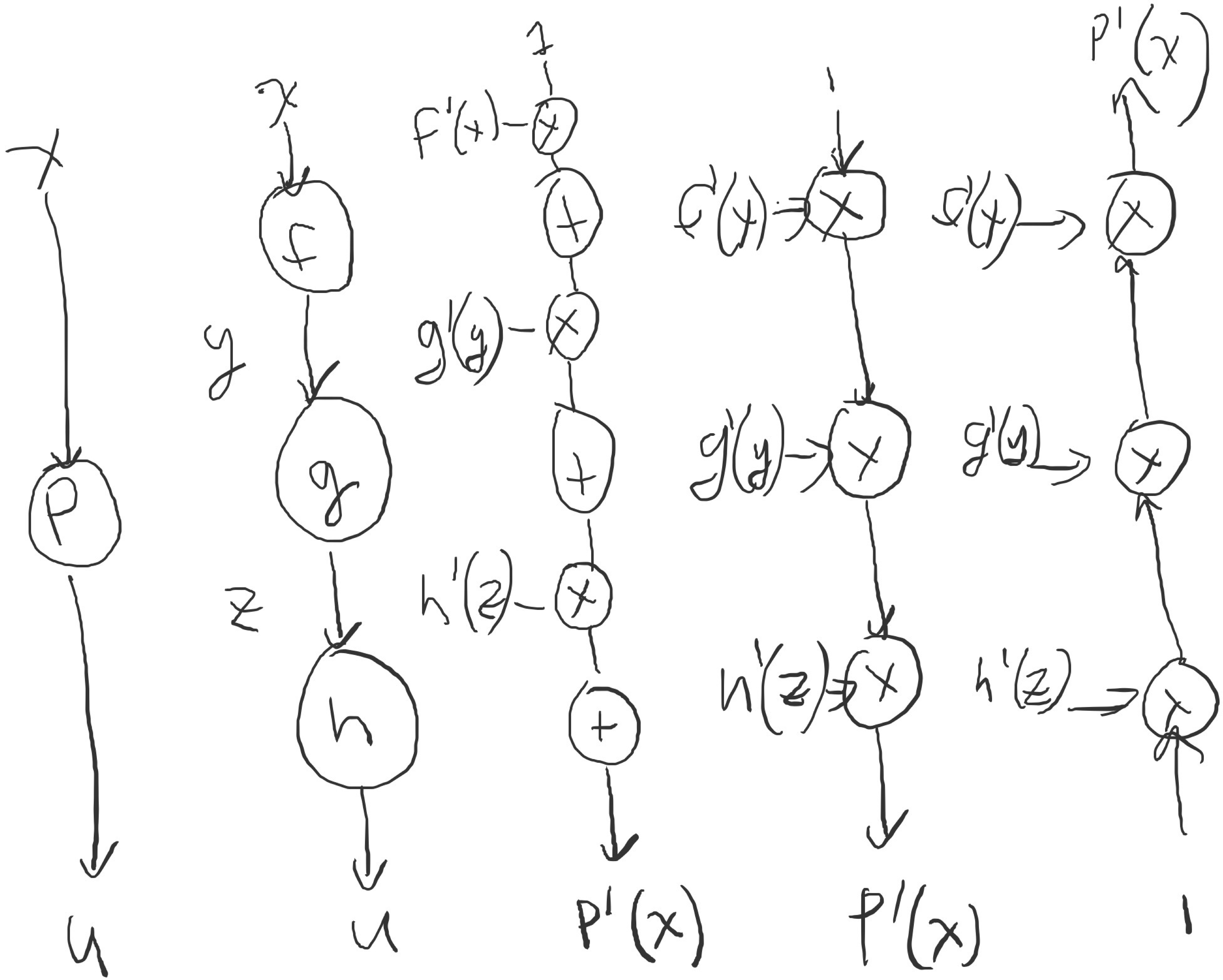
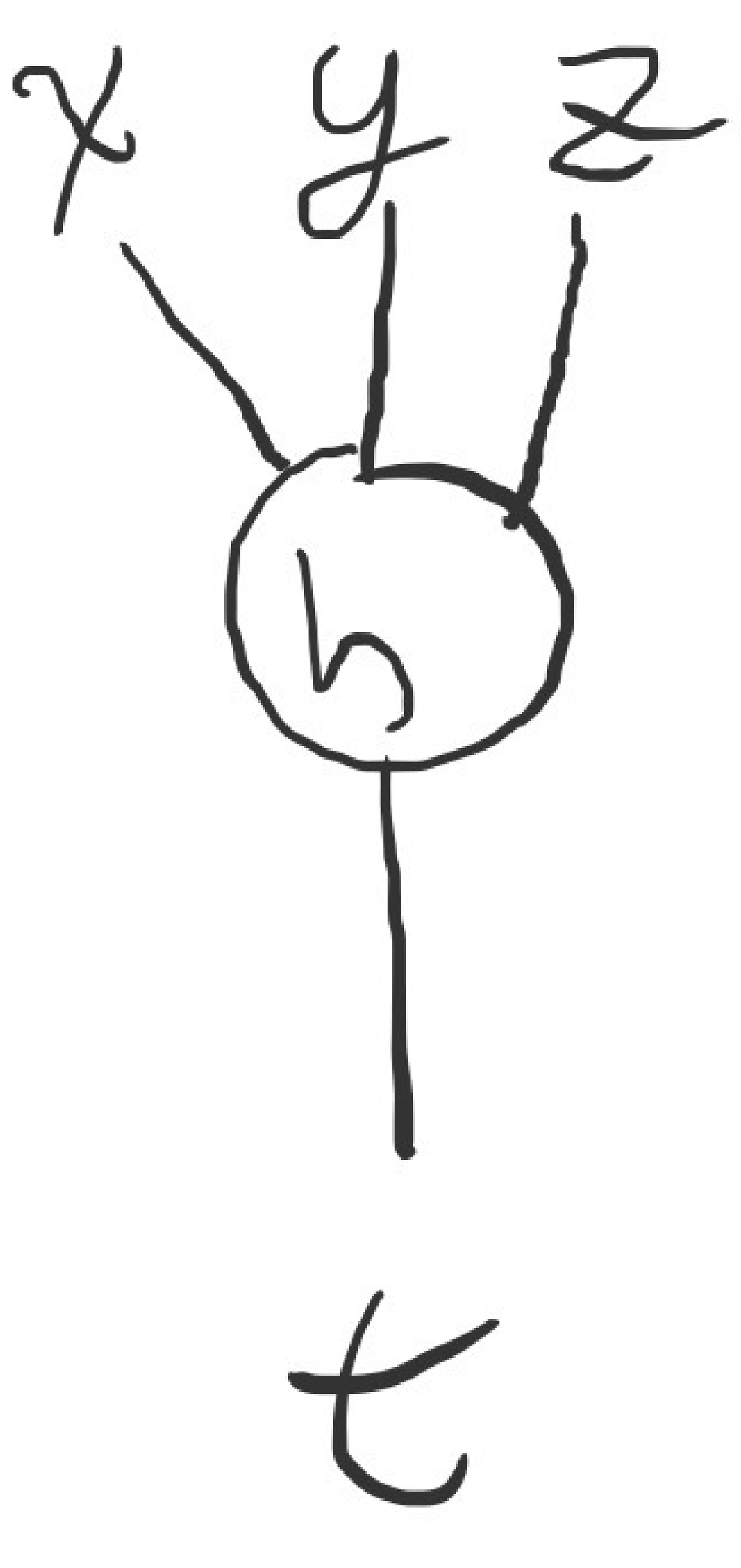


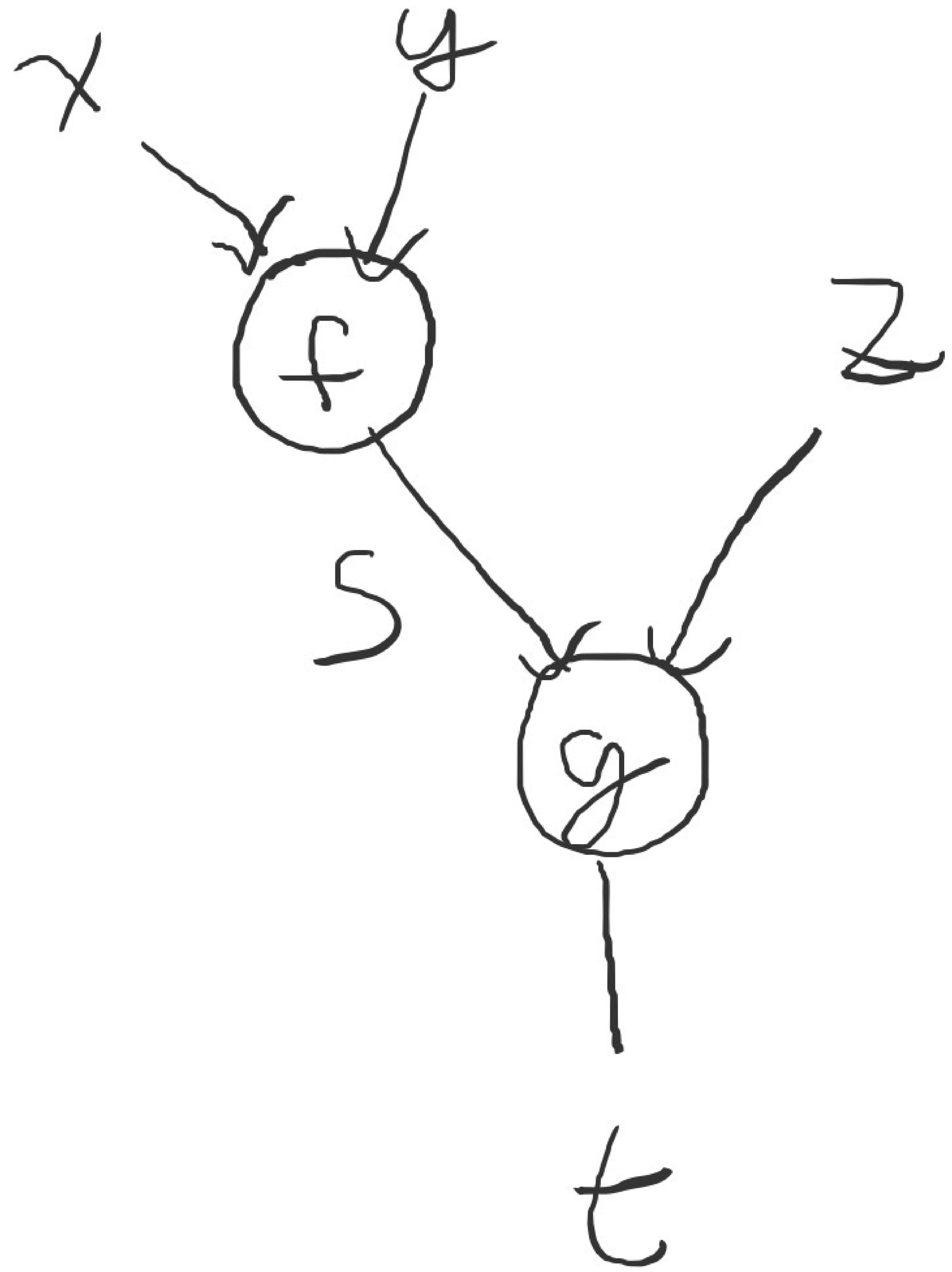
$$\frac{du}{dx} = \frac{du}{dz} \times \frac{dz}{dy} \times \frac{dy}{dx}$$

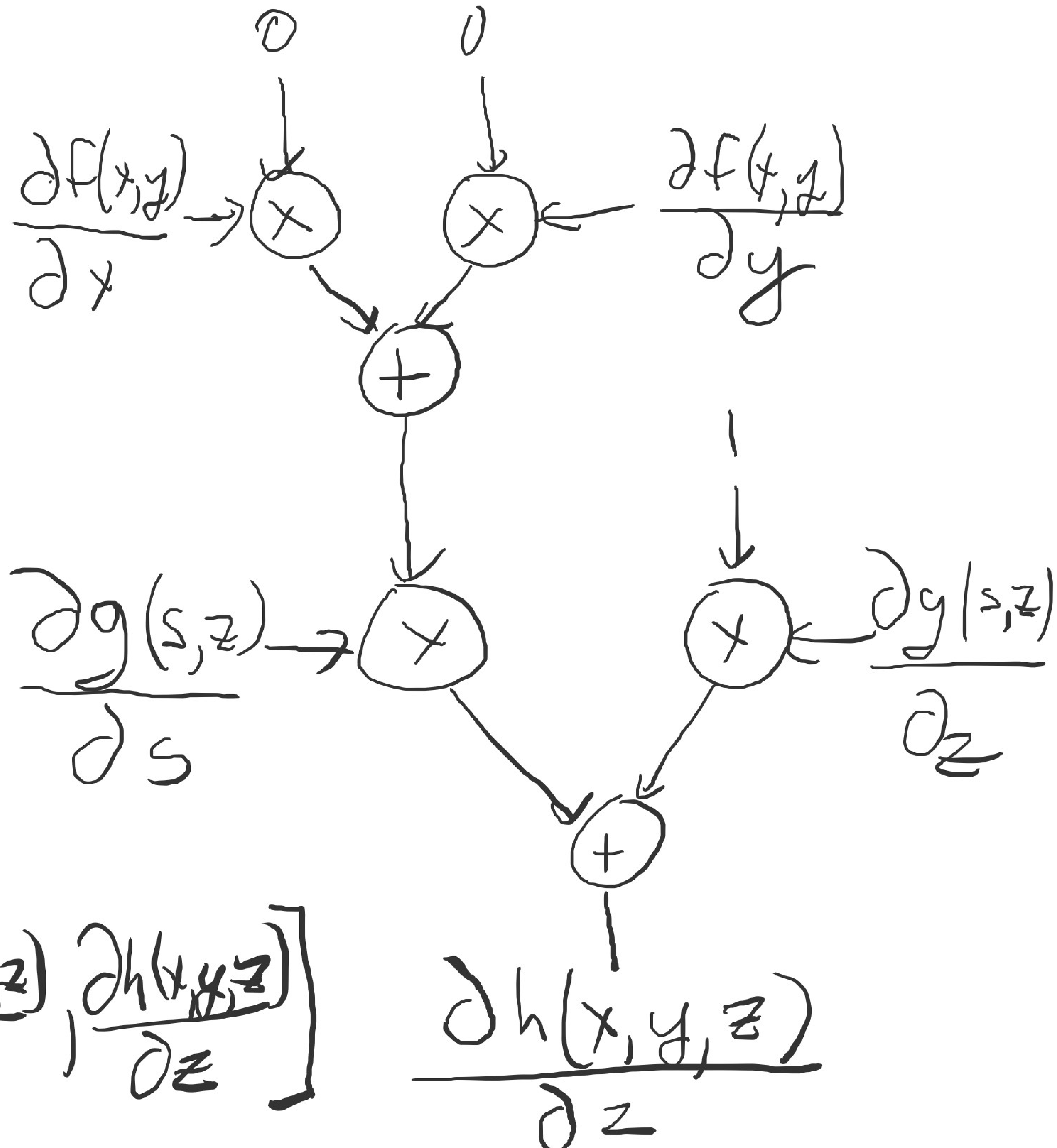
$$= \left(h'(z) \times \left(g'(y) \times \left(f'(x) \times 1 \right) \right) \right)$$

$$= \left(\left(1 \times h'(z) \right) \times g'(y) \right) \times f'(x) \Big)$$


x
p
u
x
f
y
g
z
h
u
1
f'(x)
g'(y)
h'(z)
p'(x)
1
f'(y)
g'(y)
h'(z)
p'(x)
p'(x)
f'(y)
g'(y)
h'(z)
1

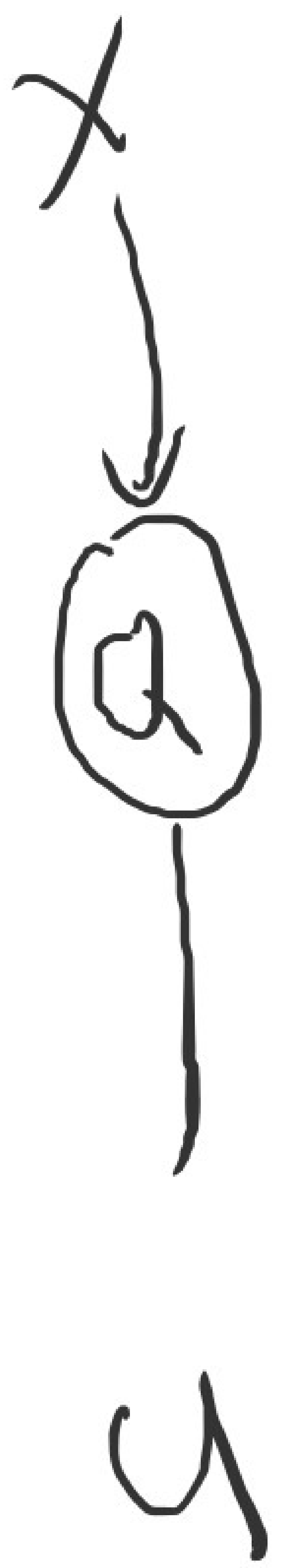


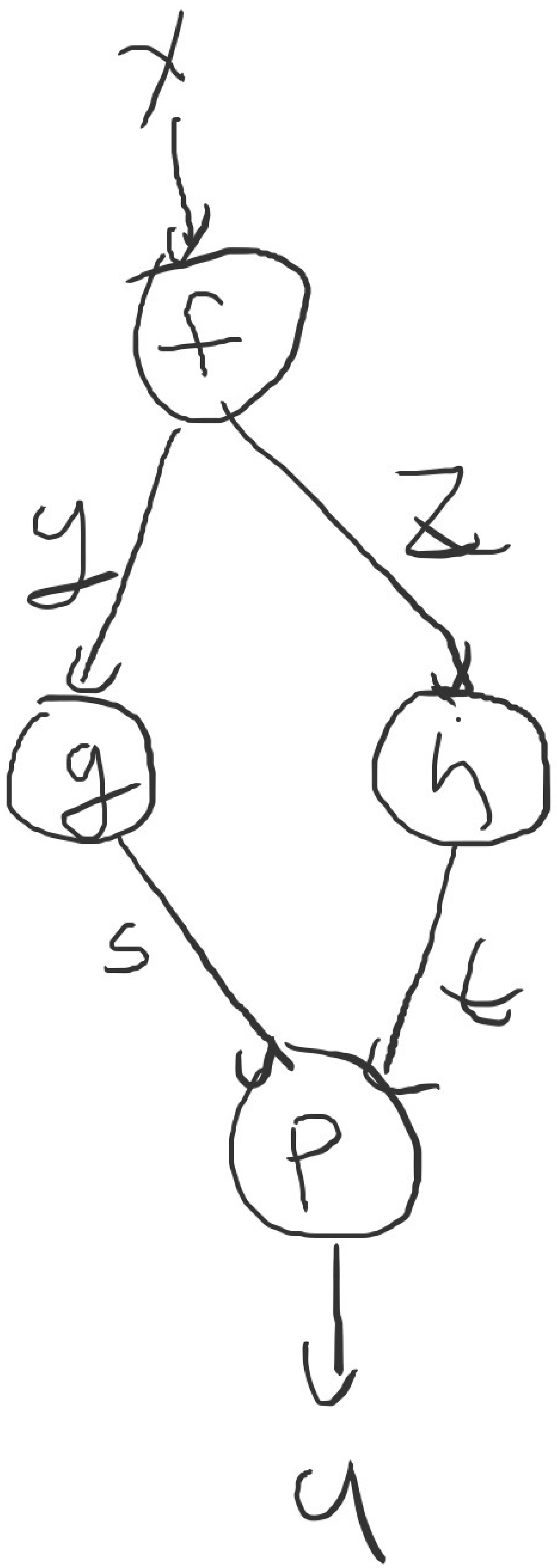


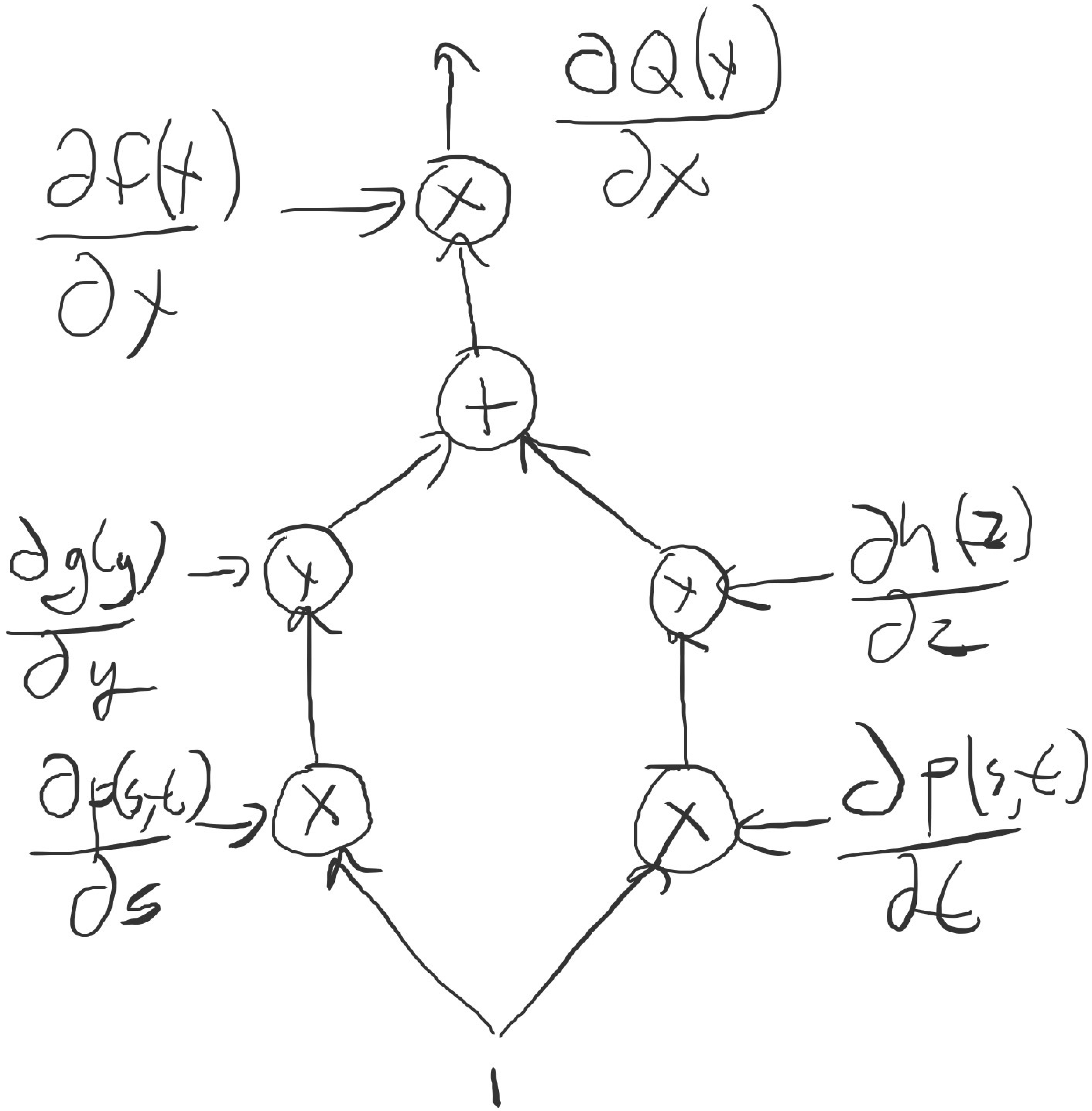


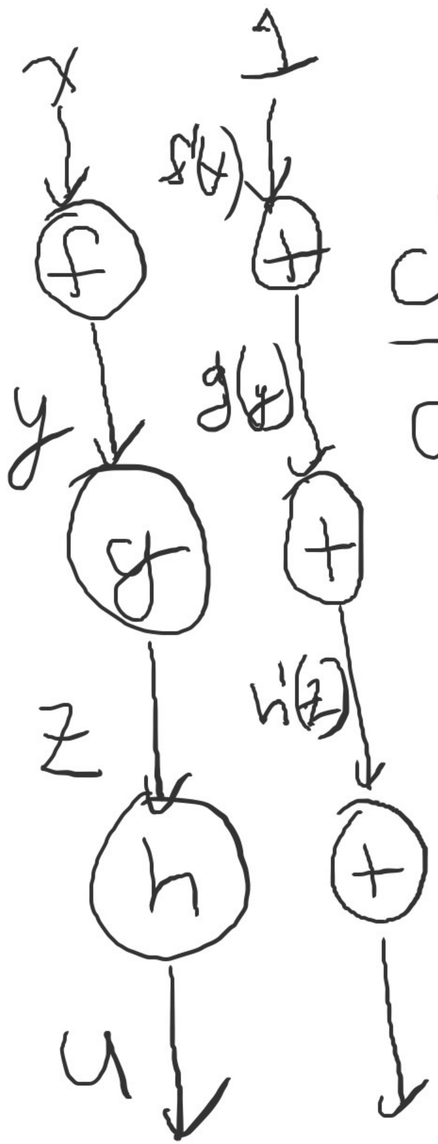
$$\nabla h = \left[\frac{\partial h(x,y,z)}{\partial x}, \frac{\partial h(x,y,z)}{\partial y}, \frac{\partial h(x,y,z)}{\partial z} \right]$$

x y z
h
t
x y
f
s
z
g
t
∂h(x,y,z)/∂x
∂h(x,y,z)/∂y
∂f(x,y)/∂x
∂f(x,y)/∂y
∂h(x,y,z)/∂z
∂g(s,z)/∂s
∂g(s,z)/∂z
1


x
q
y


x
f
y
z
g
h
s
t
p
y

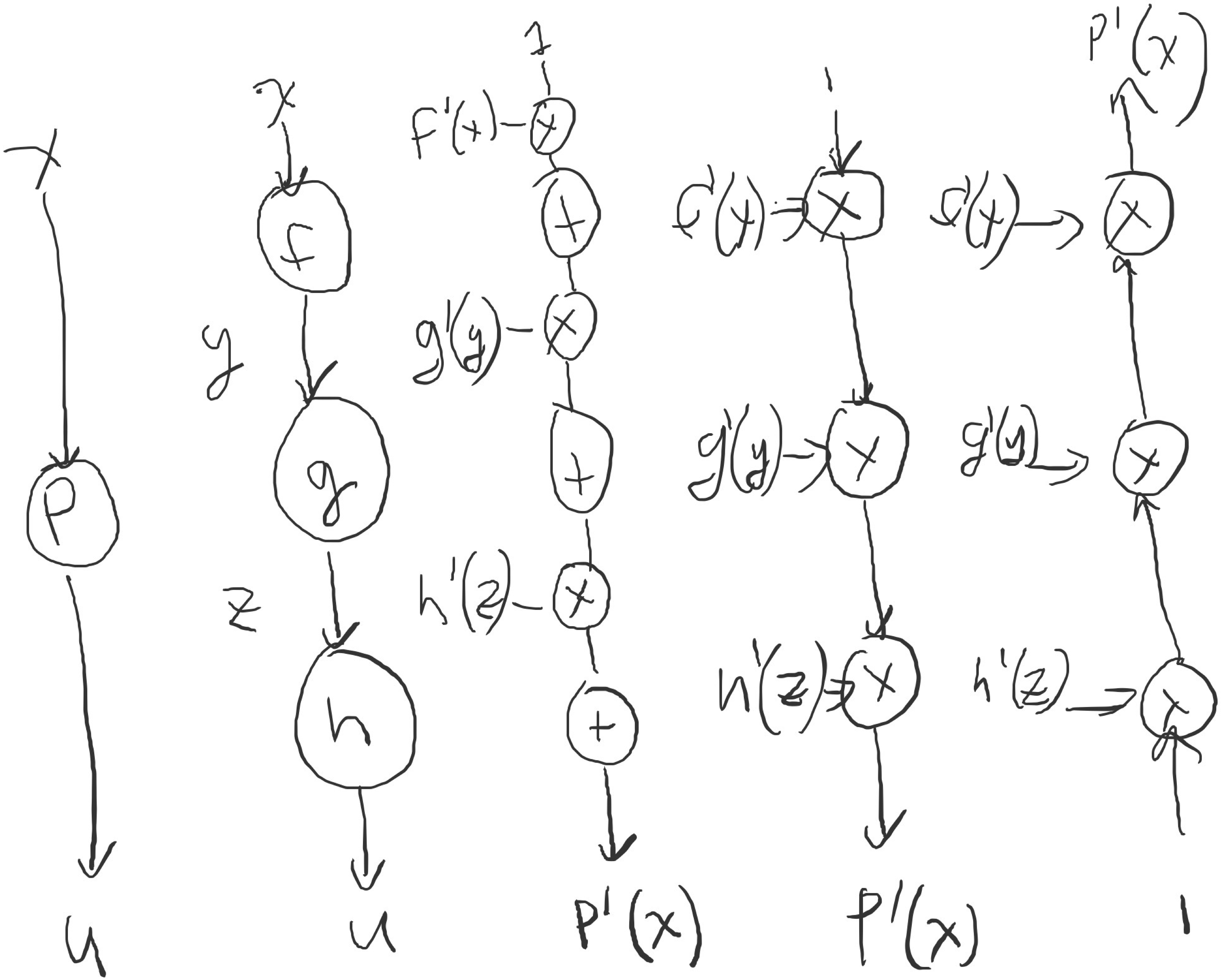

∂Q(x)/∂x
∂f(x)/∂x
×
+
∂g(y)/∂y
×
×
∂h(z)/∂z
∂p(s,t)/∂s
×
×
∂p(s,t)/∂t
1

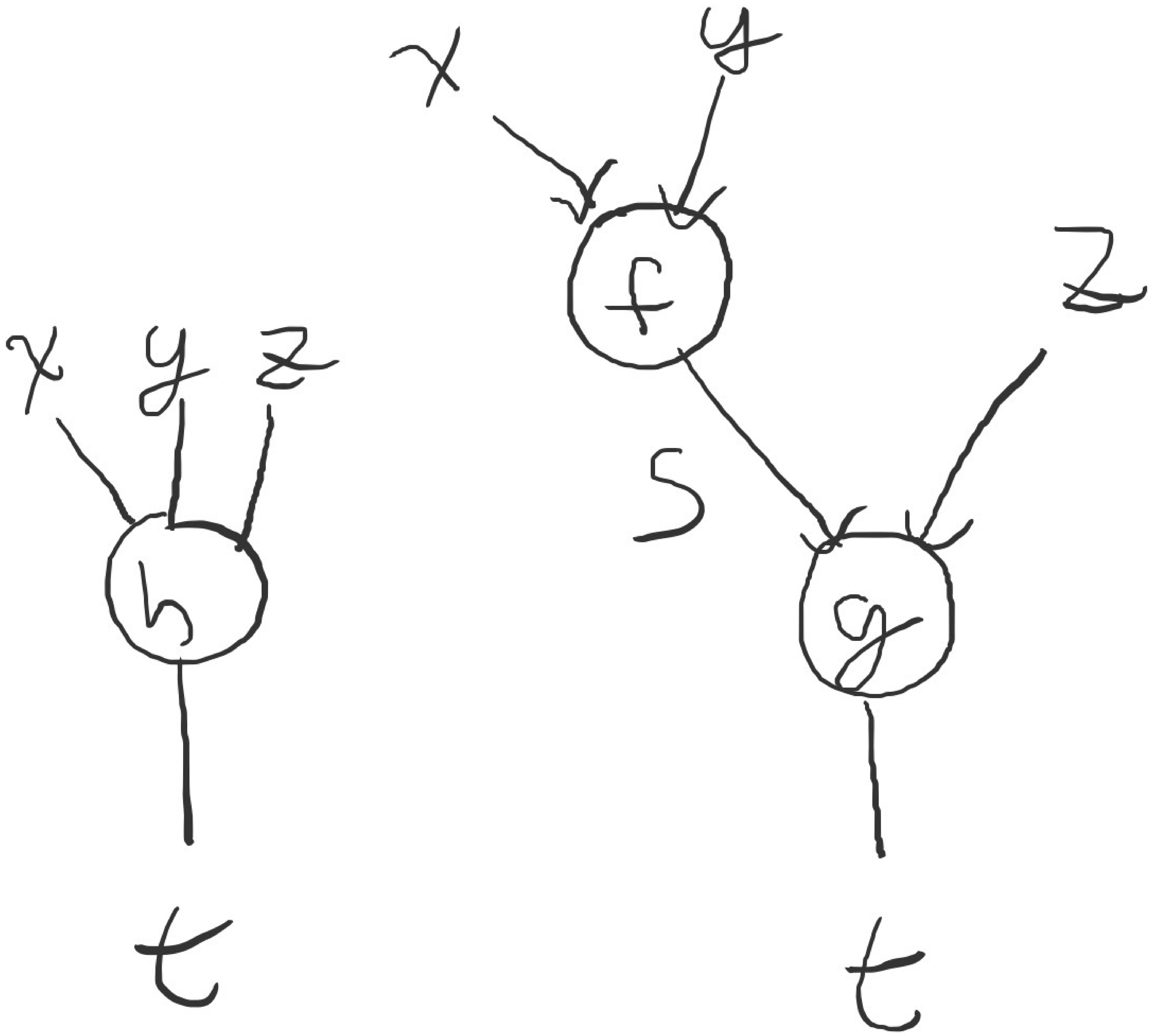


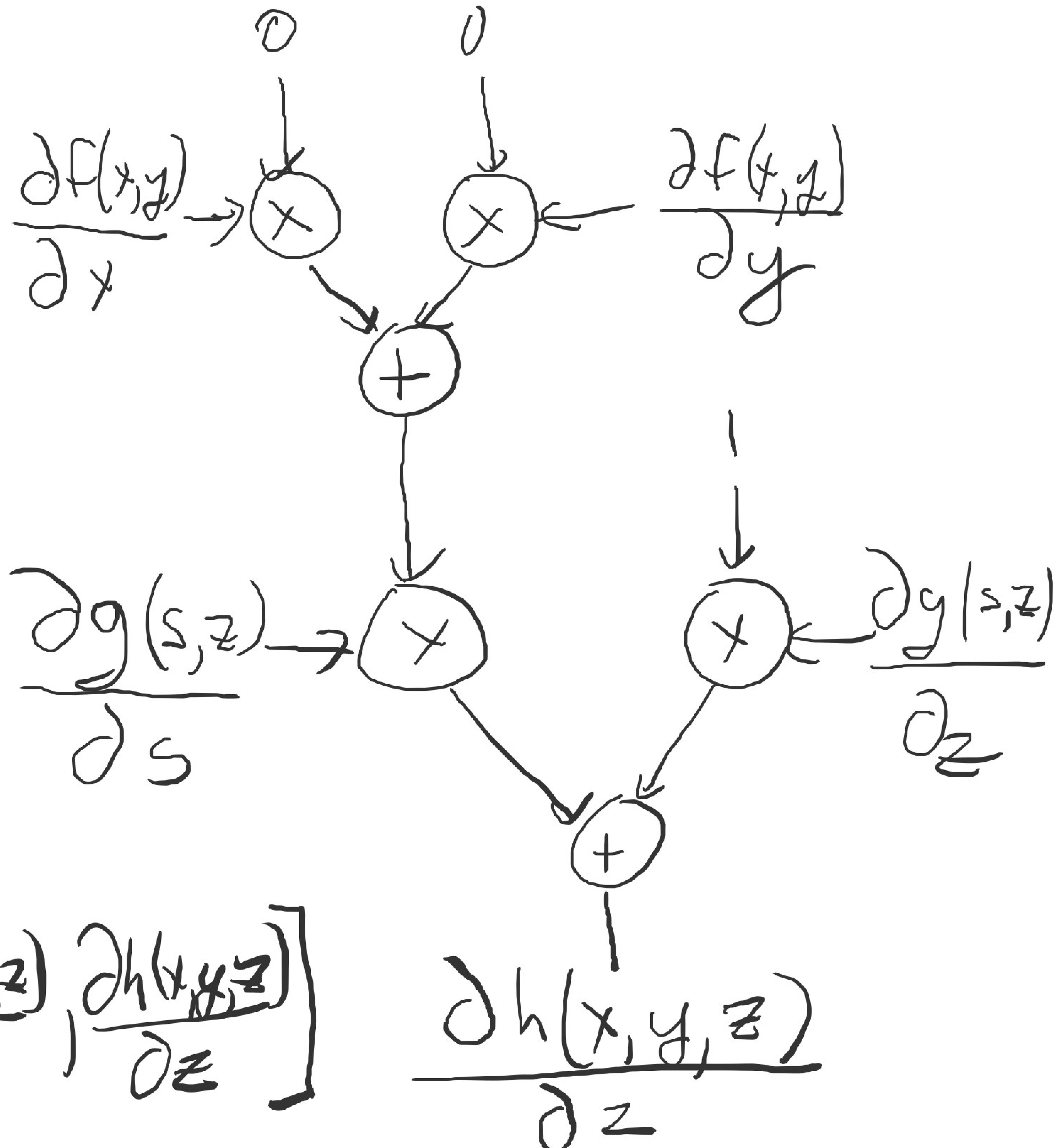
$$\frac{du}{dx} = \frac{du}{dz} \times \frac{dz}{dy} \times \frac{dy}{dx}$$

$$= \left(h'(z) \times \left(g'(y) \times \left(f'(x) \times 1 \right) \right) \right)$$

$$= \left(\left(1 \times h'(z) \right) \times g'(y) \right) \times f'(x) \Big)$$

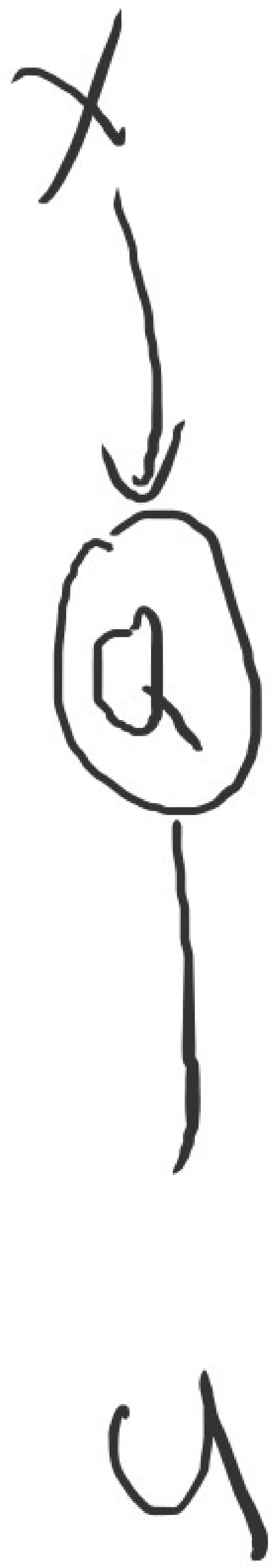

x
P
u
x
f
y
g
z
h
u
1
f'(x)
g'(y)
h'(z)
P'(x)
1
f'(y)
g'(y)
h'(z)
P'(x)
P'(x)
f'(y)
g'(y)
h'(z)
1

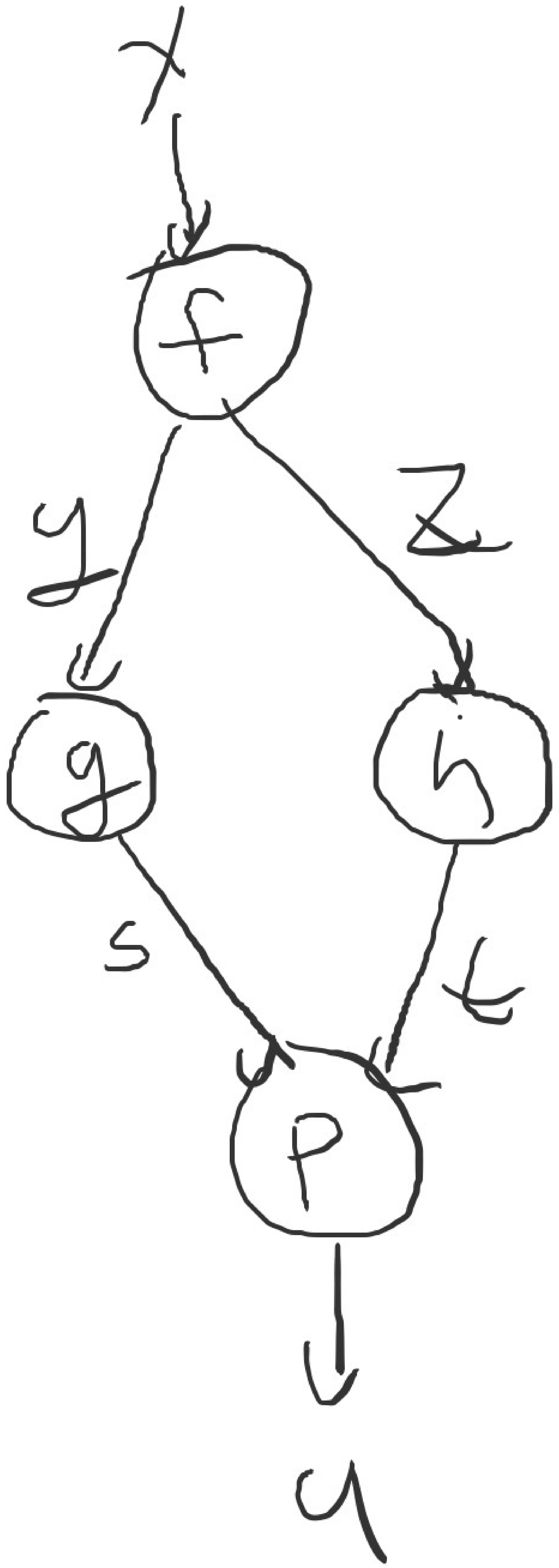


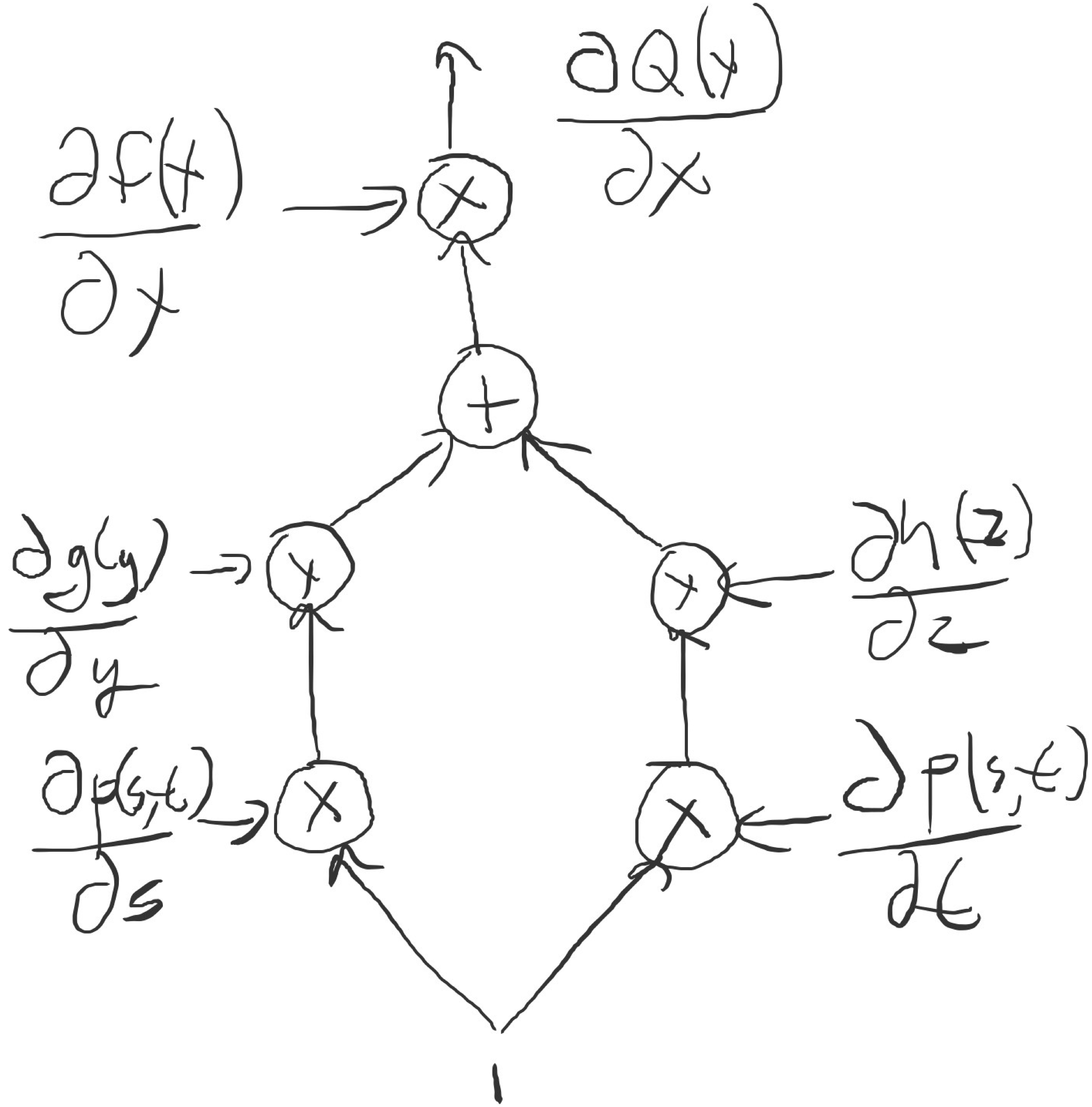


$$\nabla h = \left[\frac{\partial h(x,y,z)}{\partial x}, \frac{\partial h(x,y,z)}{\partial y}, \frac{\partial h(x,y,z)}{\partial z} \right]$$

x
y
z
h
t
f
s
g
∂h(x,y,z)/∂x
∂h(x,y,z)/∂y
∂f(x,y)/∂x
∂f(x,y)/∂y
∂h(x,y,z)/∂z
∂g(s,z)/∂s
∂g(s,z)/∂z
1

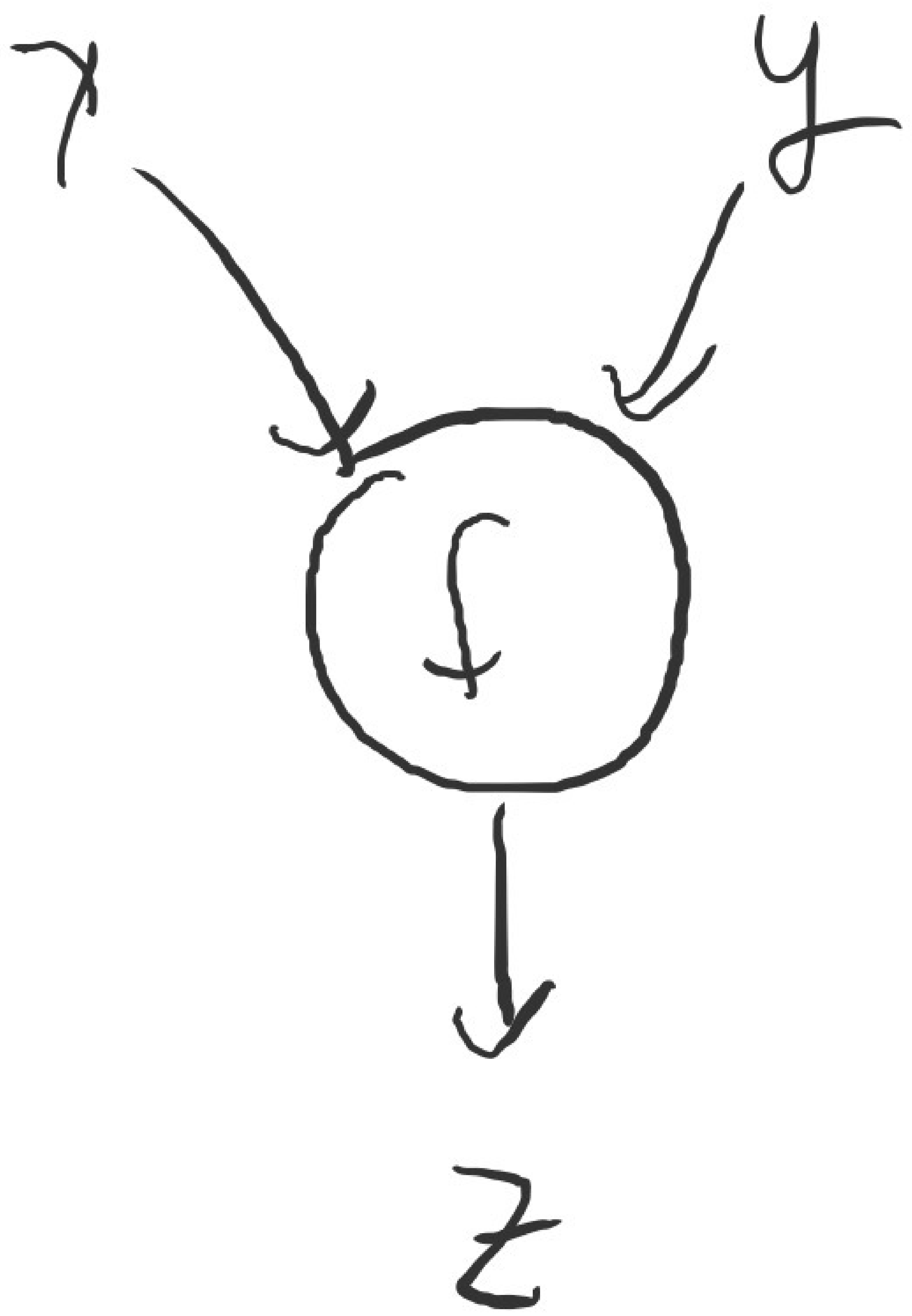

x
q
u

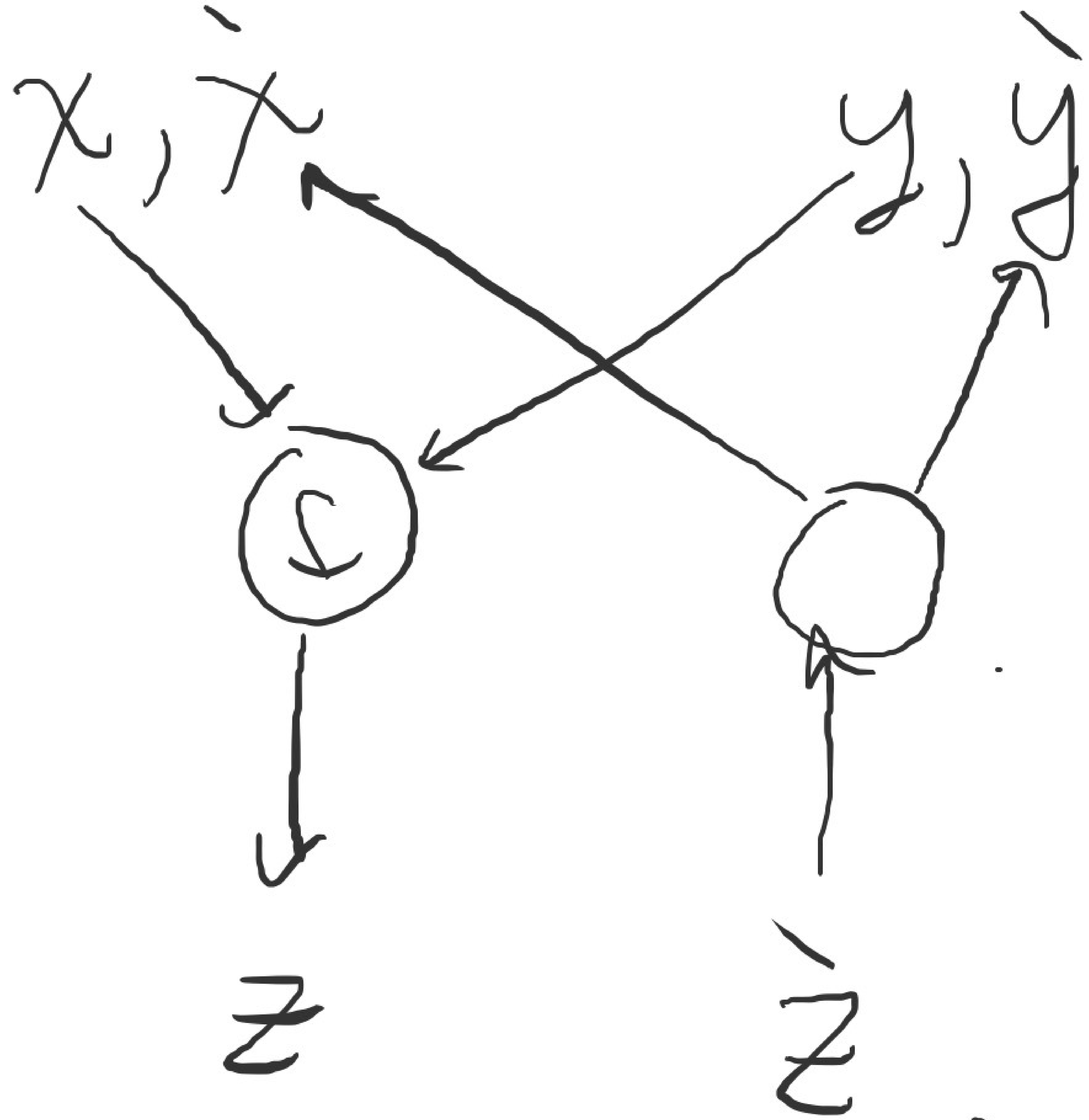

x
f
y
z
g
h
s
t
p
u


∂Q(x)/∂x
∂f(x)/∂x
×
+
∂g(y)/∂y
×
×
∂h(z)/∂z
∂p(s,t)/∂s
×
×
∂p(s,t)/∂t
1

$$z = f(x,y) \qquad \bar{z} = \frac{\partial z}{\partial x} \times \bar{x} + \frac{\partial z}{\partial y} \times \bar{y}$$

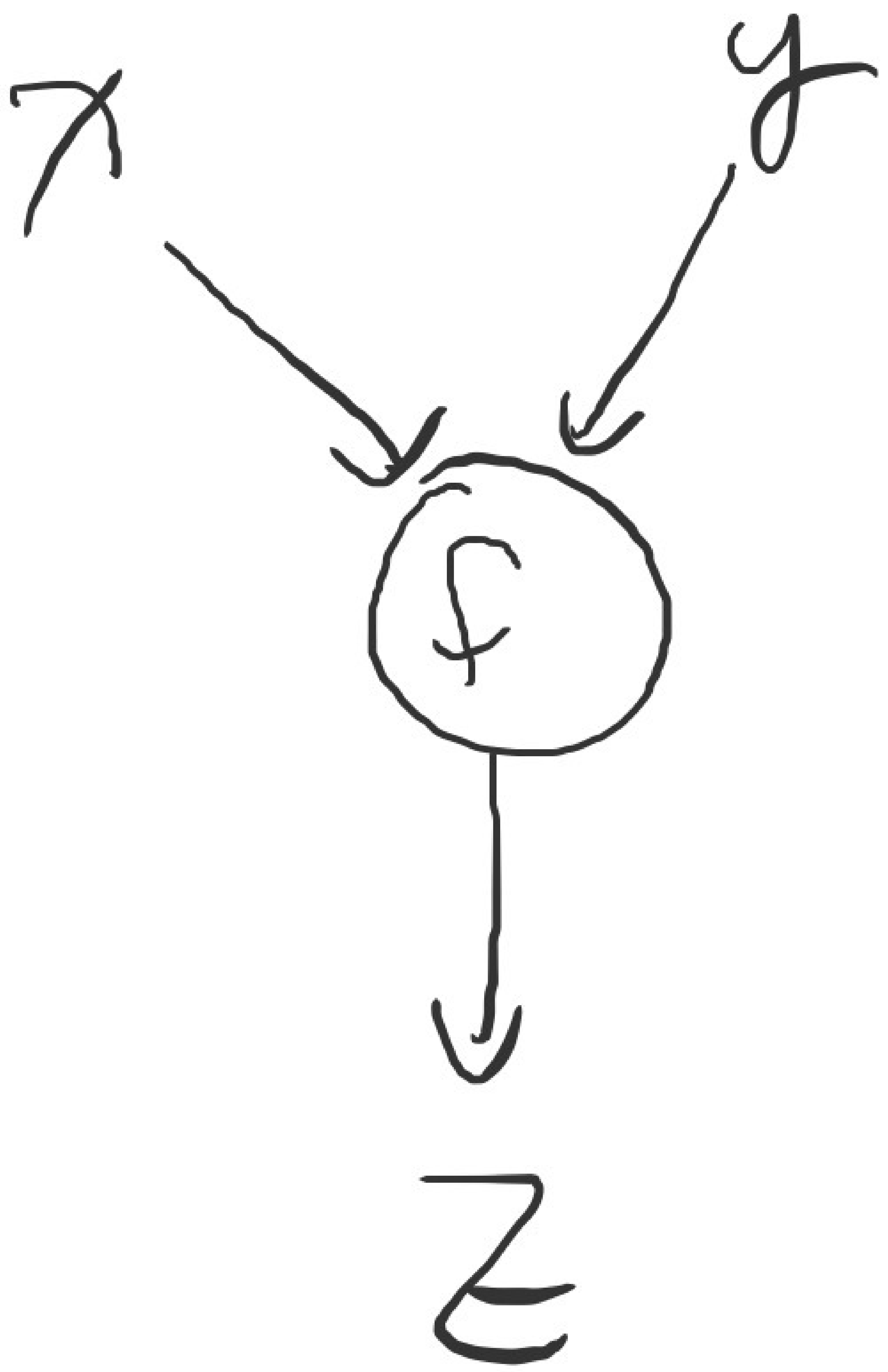
$$= \frac{\partial f(x,y)}{\partial x} \bar{x} + \frac{\partial f(x,y)}{\partial y} \bar{y}$$

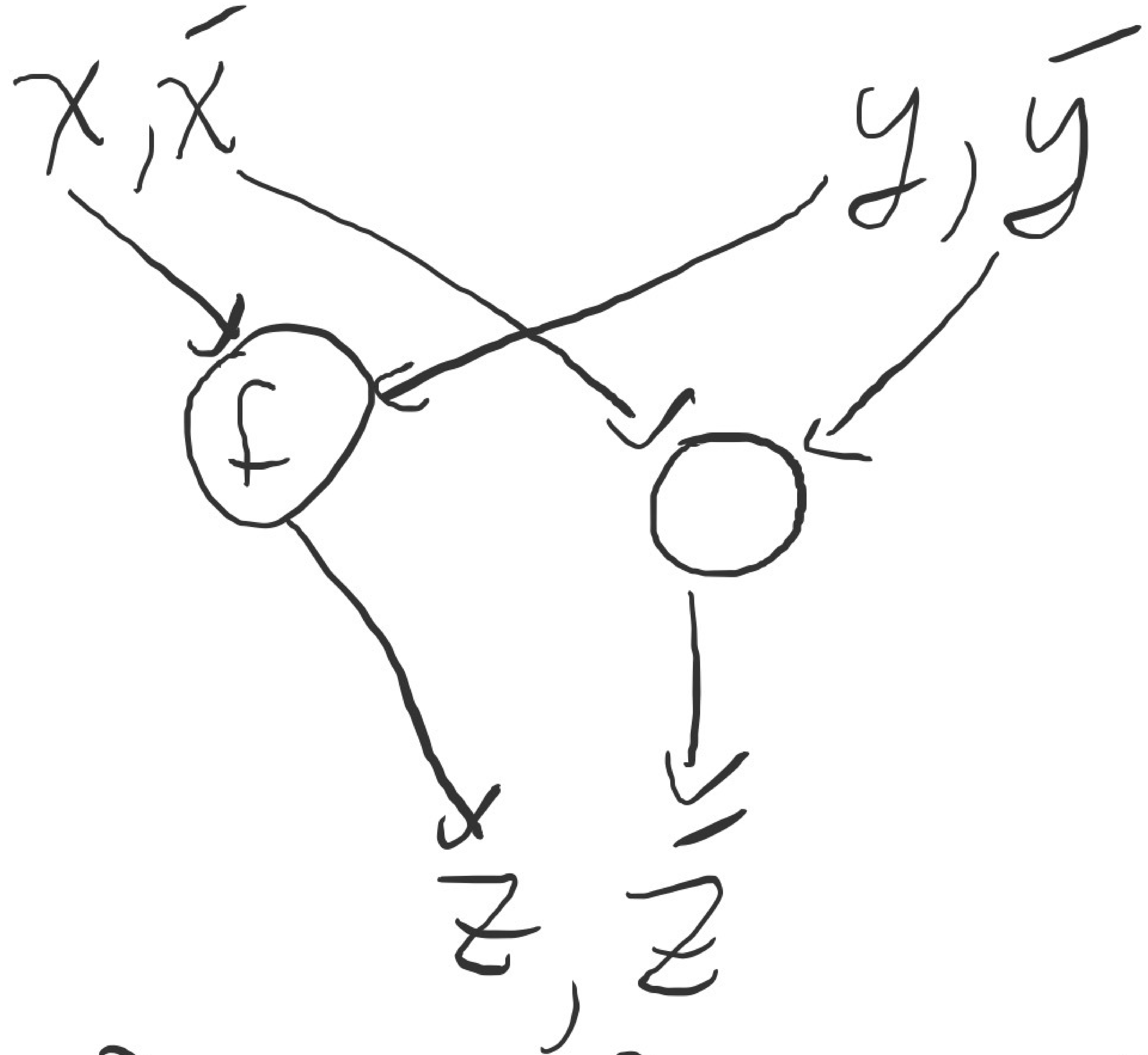




$$\grave{x} = \grave{z} \times \frac{\partial z}{\partial y} = \grave{z} \times \frac{\partial f(x,y)}{\partial x}$$

$$\grave{y} = \grave{z} \times \frac{\partial z}{\partial y} = \grave{z} \times \frac{\partial f(x,y)}{\partial y}$$

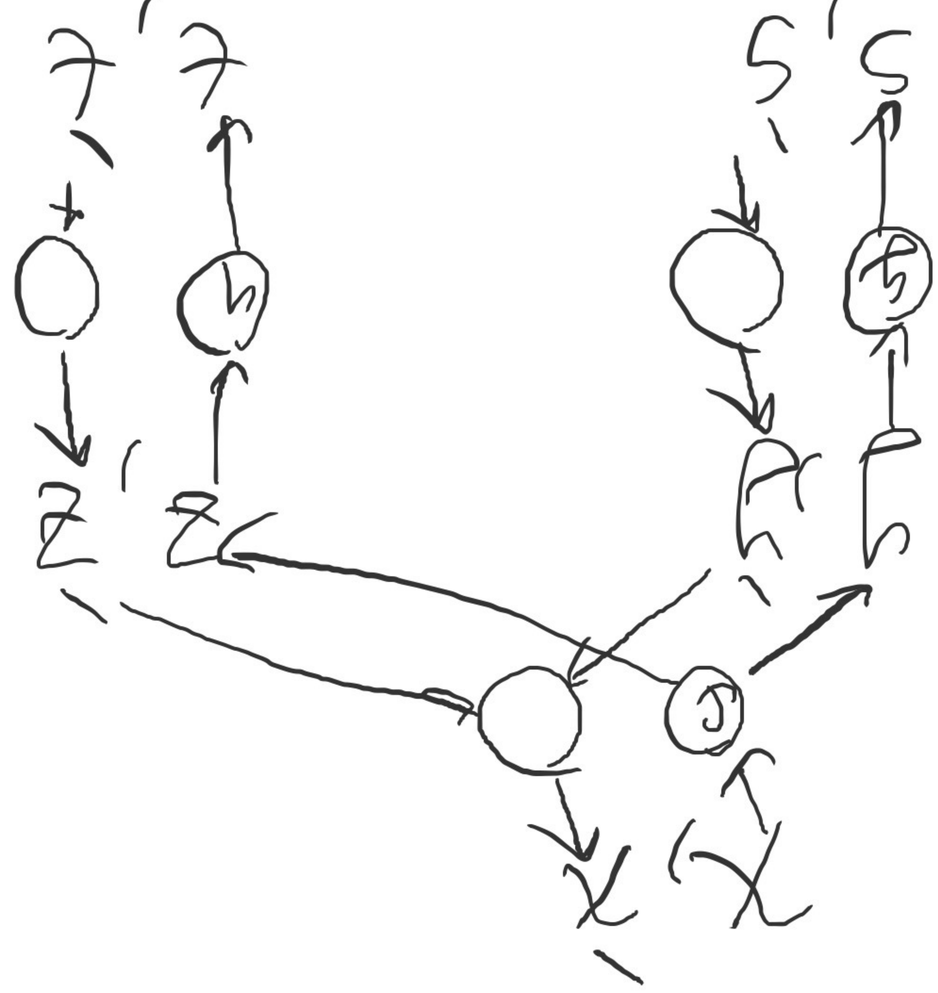




$$\bar{z} = \frac{\partial z}{\partial x}\times\bar{x} + \frac{\partial z}{\partial y}\times\bar{y} = \frac{\partial f(x,y)}{\partial x}\bar{x} + \frac{\partial f(x,y)}{\partial y}\bar{y}$$

$$\frac{\partial L}{\partial (x+z)} =$$

$$\frac{\partial L}{\partial x} z + \frac{\partial L}{\partial y} y = \frac{\partial L}{\partial z} z + \frac{\partial L}{\partial h} y = x$$



$$\frac{\partial L}{\partial (z)} = \frac{\partial L}{\partial z} z = z$$

$$\frac{\partial L}{\partial (y)} = \frac{\partial L}{\partial y} y = y$$