① Assignment 1 – IDS 576

$$f(a,b,c,d,e) = \frac{1}{(1+(a^b+c^d)*e)^2}$$

$(a,b,c,d,e) = (1,1,1,1,1)$

$x = a^b$, $y = c^d$, $W = x + y$, $z = W * e$

$\frac{\partial x}{\partial a} = b a^{b-1}$

$\frac{\partial f}{\partial x} = -2e/(z+1)^3$

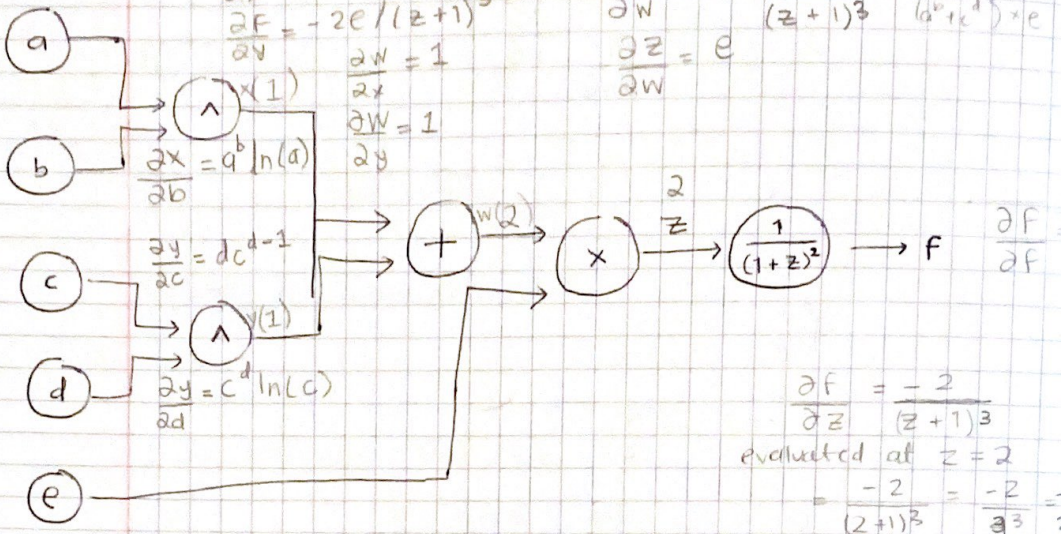
$\frac{\partial f}{\partial y} = -2e/(z+1)^3$

$\frac{\partial W}{\partial x} = 1$

$\frac{\partial W}{\partial y} = 1$

$\frac{\partial f}{\partial W} = e * \frac{-2}{(z+1)^3}$ $\quad (a^b+c^d)*e$

$\frac{\partial z}{\partial W} = e$



$\frac{\partial f}{\partial f} = 1$

$\frac{\partial f}{\partial z} = \frac{-2}{(z+1)^3}$

evaluated at $z = 2$

$= \frac{-2}{(2+1)^3} = \frac{-2}{3^3} = \frac{-2}{27}$

$\left.\frac{\partial f}{\partial z}\right|_{z=2} = \boxed{\frac{-2}{27}}$

$\frac{\partial f}{\partial a} = \frac{-2e}{(z+1)^3} * b a^{b-1}$

evaluated @ $(a,b,c,d,e) = (1,1,1,1,1)$

$\frac{\partial f}{\partial a} = \boxed{-0.074}$

$\frac{\partial f}{\partial b} = \frac{-2e}{(z+1)^3} * a^b \ln(a)$

evaluated:

$\frac{\partial f}{\partial b} = \boxed{0}$

$\frac{\partial f}{\partial c} = \frac{-2e}{(z+1)^3} * d c^{d-1}$

evaluated:

$\frac{\partial f}{\partial c} = \boxed{-0.074}$

$\frac{\partial f}{\partial d} = \frac{-2e}{(z+1)^3} * c^d \ln(c)$

evaluated:

$\frac{\partial f}{\partial d} = \boxed{0}$

$\frac{\partial z}{\partial e} = W$

$\frac{\partial f}{\partial e} = \frac{-2}{(z+1)^3} * W$

$\left.\frac{\partial f}{\partial e}\right|_{(a,b,c,d,e)=(1,1,1,1,1)} = \frac{-2}{(((a^b+c^d)*e)+1)^3} * (a^b + c^d)$

$= \frac{-2}{((1+1*1)+1)^3} * (1+1)$

$= \frac{-2}{3^3} * 2 = \boxed{\frac{-4}{27}}$ $\quad \frac{\partial f}{\partial e}$

$\frac{\partial f}{\partial a} = \frac{-2(1) * (1 \overbrace{1^{1-1}}^{1})}{((1^1+1^1)*1+1)} = \frac{-2*1}{(2*1)+1)^3} = \frac{-2}{(2+1)^3} = \frac{-2}{3^3} = \frac{-2}{27} = \boxed{0.074}$

$\frac{\partial f}{\partial b} = \frac{-2(1) * (1^1 \ln(1))}{(((1^1+1^1)*1)+1)^3} = \frac{-2*(0)}{((1+1)*1+1)^3} = \boxed{0}$