

HOMEOEK 2

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PROBLEM 1

The computational graph is shown as follow,

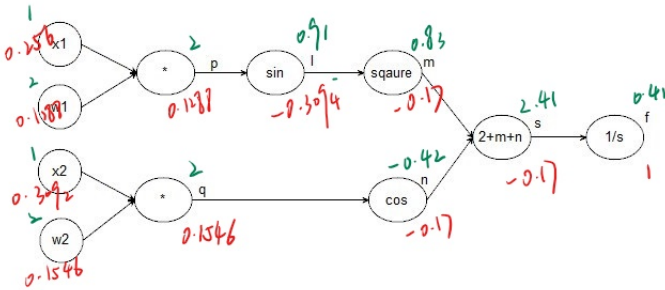


Fig. 1. Computational Graph

And the derication is as follow:

$$\frac{df}{dx_1} = -\frac{2w_1 \sin(w_1 x_1) \cos(w_1 x_1)}{(2 + \sin^2(w_1 x_1) + \cos(w_2 x_2))^2}$$

$$\frac{df}{dw_1} = -\frac{2x_1 \sin(w_1 x_1) \cos(w_1 x_1)}{(2 + \sin^2(w_1 x_1) + \cos(w_2 x_2))^2}$$

$$\frac{df}{dx_2} = \frac{w_2 \sin(w_2 x_2)}{(2 + \sin^2(w_1 x_1) + \cos(w_2 x_2))^2}$$

$$\frac{df}{dw_2} = \frac{x_2 \sin(w_2 x_2)}{(2 + \sin^2(w_1 x_1) + \cos(w_2 x_2))^2}$$

The result computed by program and above functions with input being $x = [1, 1]$ $w = [2, 2]$ are as follow, we can see that they are exactly the same.

```
PS C:\Users\Really Monkey> & "C:/Users/Really Monkey
df_x1 by hand 0.26045651924973107
df_x1 by program 0.26045651924973107
df_x2 by hand 0.3129382424372049
df_x2 by program 0.3129382424372049
df_w1 by hand 0.13022825962486553
df_w1 by program 0.13022825962486553
df_w2 by hand 0.15646912121860246
df_w2 by program 0.15646912121860246
PS C:\Users\Really Monkey>
```

Fig. 2. Program Result

PROBLEM 2

The computational graph is shown as follow,

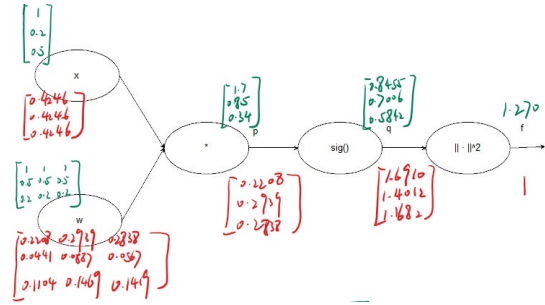


Fig. 3. Computational Graph

The result from program is as follow. As we can see the results are the same as the above.

```
df_w
[[0.22086339 0.29391989 0.28381373]
 [0.04417268 0.05878398 0.05676275]
 [0.1104317 0.14695995 0.14190686]]
df_x
[[0.42458608]
 [0.42458608]
 [0.42458608]]
```

Fig. 4. Computational Graph