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3a) $\sin(\cos(x) + \sin(2y))$

$= \cos(\cos(x) + \sin(2y)) * (d/dx)[\cos(x) + \sin(2y)]$

$= \cos(\cos(x) + \sin(2y)) ((d/dx)[\cos(x)] + (d/dx)[\sin(2y)])$

$= \cos(\cos(x) + \sin(2y)) ((-\sin(x)) + 0)$

$= -\sin(x)\cos(\cos(x) + \sin(2y))$

3b) $\sin(\cos(x) + \sin(2y))$

$= \cos(\sin(2y) + \cos(x)) * (d/dy)[\sin(2y) + \cos(x)]$

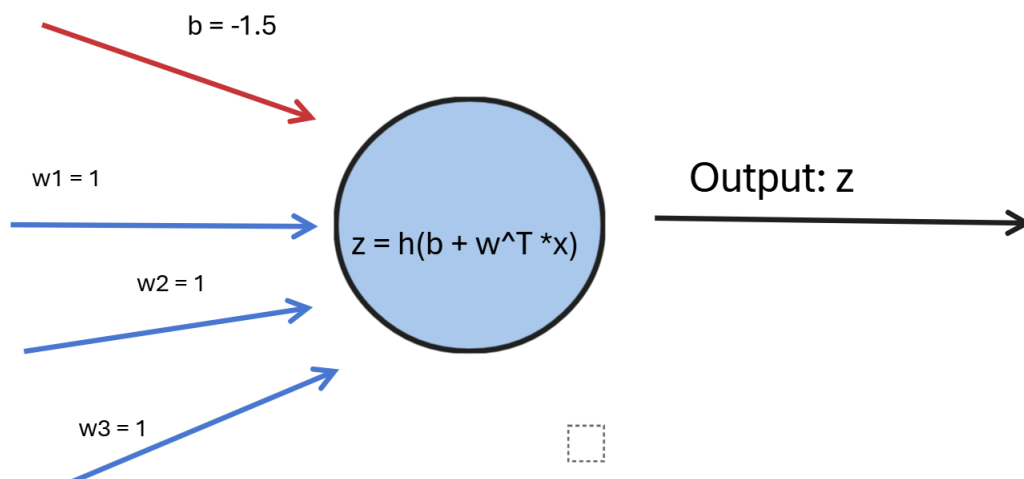$= \cos(\sin(2y) + \cos(x)) * ((d/dy)[\sin(2y)] + (d/dy)[\cos(x)])$

$= \cos(\sin(2y) + \cos(x)) * (\cos(2y) * (d/dy)[2y] + 0)$

$= \cos(\sin(2y) + \cos(x)) * \cos(2y) * 2$

$= 2\cos(\sin(2y) + \cos(x))\cos(2y)$

3c) $\nabla foo(x,y) = (-\sin(x)\cos(\cos(x) + \sin(2y)), 2\cos(\sin(2y) + \cos(x))\cos(2y))$
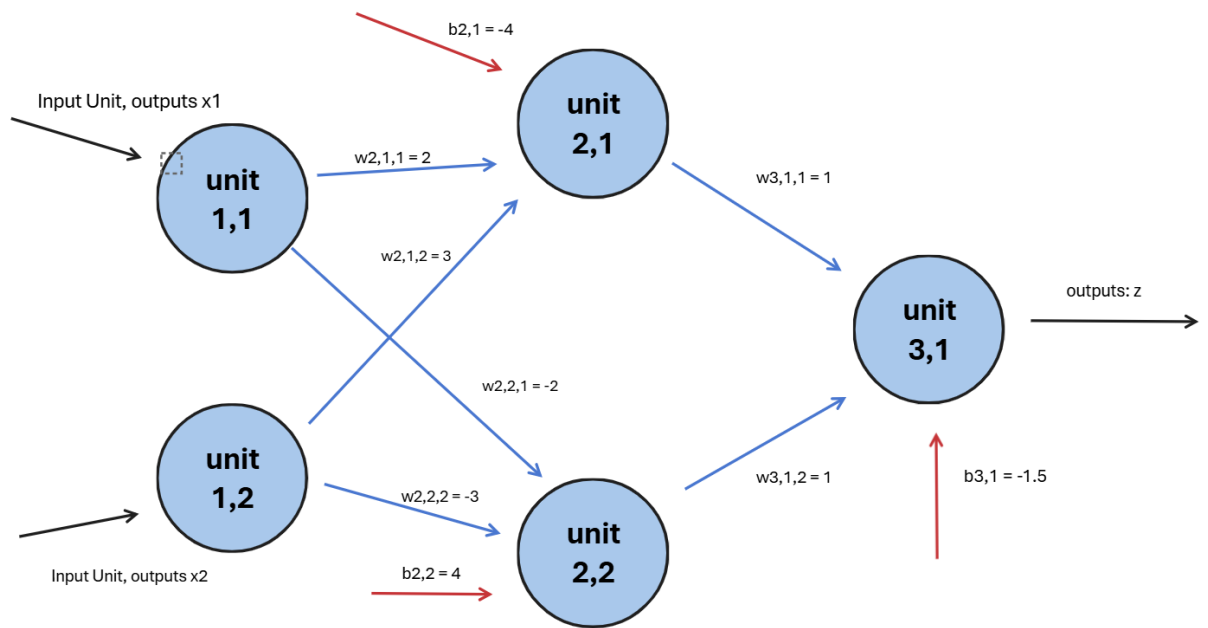
5) $b = -1.5$; $w1 = w2 = w3 = 1$

6) Structure: layer 1 is the input layer with 2 units (unit 1,1 and unit 1,2), where unit 1,1 and 1,2 outputs x1, x2 respectively. Layer 2 has 2 units (unit 2,1 and unit 2,2) that output to unit 3,1 in layer 3. Layer 3 has 1 unit (unit 3,1), that takes input from layer 2 and outputs z.

Unit 2,1: $b = -4$, $w2,1,1 = 2$, $w2,1,2 = 3$

Unit 2,2: $b = 4$, $w2,2,1 = -2$, $w2,2,2 = -3$

Unit 3,1: $b = -1.5$, $w3,1,1 = 1$, $w3,1,2 = 1$

7) Yes, it is possible to design a neural network that satisfies the specs listed in task 7.

- $b2,1=-3$, $b2,2=7$, $b3,1=-1.5$; $w2,1=1$, $w2,2=-1$, $w3,1,1=1$, $w3,1,2=1$