Problem 1

a) $in\_h_1 = 0 \times 2.5 + 1 \times 1 + 1.5 \times 1 = 2.5$

$a\_h_1 = g(2.5) = \frac{1}{1+e^{-2.5}} = 0.92$

$in\_h_2 = 0 \times (-1.5) + (-3) \times 1 + 2 \times 1 = -1$

$a\_h_2 = g(-1) = \frac{1}{1+e^{1}} = 0.2689$

$in\_\hat{y} = 0.92 \times 1 + 0.2689 \times 0.5 + 1 \times (-1) = 0.05445$

$a\_\hat{y} = g(0.05445) = \frac{1}{1+e^{0.05445}} = 0.4864$ → 0.5136

b) Sigmoid function : $g(z) = \frac{1}{1+e^{-z}}$, $g'(z) = g(z)(1-g(z))$

0.5136

$error\_\hat{y} = 0.4864 \times (1-0.4864) \times \frac{1}{2}(1-0.4864)^2 = 0.0329$

$error\_h_1 = 0.92 \times (1-0.92) \times 1 \times 0.0329 = 0.00242$

$error\_h_2 = 0.2689 \times (1-0.2689) \times 0.5 \times 0.0329 = 0.00323$

$w_{\hat{y}b} = -1 + 0.1 \times 1 \times 0.0329 = -0.99671$

$w_{\hat{y}h_1} = 1 + 0.1 \times 0.92 \times 0.0329 = 1.003$

$w_{\hat{y}h_2} = 0.5 + 0.1 \times 0.2689 \times 0.0329 = 0.5009$

$w_{h_1 b} = 1.5 + 0.1 \times 1 \times 0.00242 = 1.500242$

$w_{h_1 x_1} = 2.5 + 0.1 \times 0 \times 0.00242 = 2.5$

$w_{h_1 x_2} = 1 + 0.1 \times 1 \times 0.00242 = 1.000242$

$w_{h_2 b} = 2 + 0.1 \times 1 + 0.00323 = 2.000323$

$w_{h_2 x_1} = -1.5 + 0.1 \times 0 \times 0.00323 = -1.5$

$w_{h_2 x_2} = -3 + 0.1 \times 1 + 0.00323 = -2.999677$