1. **(20 points)** Consider a three-layer feedforward neural network with *two* input neurons, *two* hidden neurons, and *two* output neurons, as illustrated below. The activation function of the hidden layer and the output layer is the *Sigmoid* function $f(x) = \frac{1}{1+e^{-x}}$.

   Given the initial model $\boldsymbol{w} = \left\{w_{11}^{(1)}, w_{12}^{(1)}, w_{21}^{(1)}, w_{22}^{(1)}, w_{11}^{(2)}, w_{12}^{(2)}, w_{21}^{(2)}, w_{22}^{(2)}\right\} =$ $\{\ 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8\}$, where $\left\{w_{11}^{(1)}, w_{12}^{(1)}, w_{21}^{(1)}, w_{22}^{(1)}\right\}$ correspond to the input-to-hidden layer weights and $\left\{w_{11}^{(2)}, w_{12}^{(2)}, w_{21}^{(2)}, w_{22}^{(2)}\right\}$ correspond to the hidden-to-output layer weights. Suppose *Stochastic Backpropagation Algorithm* is used to train the neural network, and the randomly chosen training example is $\boldsymbol{x}^1 = (3, -5)^t$ with $\boldsymbol{t}_1 = (1,0)$. What is the learned model $\boldsymbol{w}$ after training the neural networks? (Learning rate $\eta = 1$)