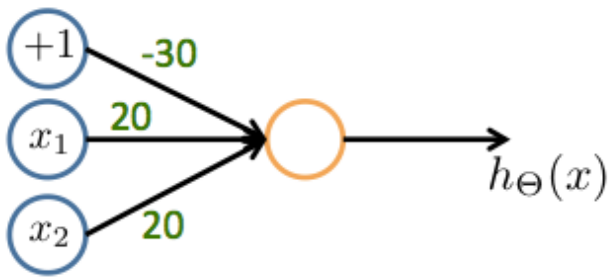
Feedback — VIII. Neural Networks: Representation

Help

You submitted this quiz on **Wed 16 Jul 2014 9:15 AM PDT**. You got a score of **5.00** out of **5.00**.

Question 1

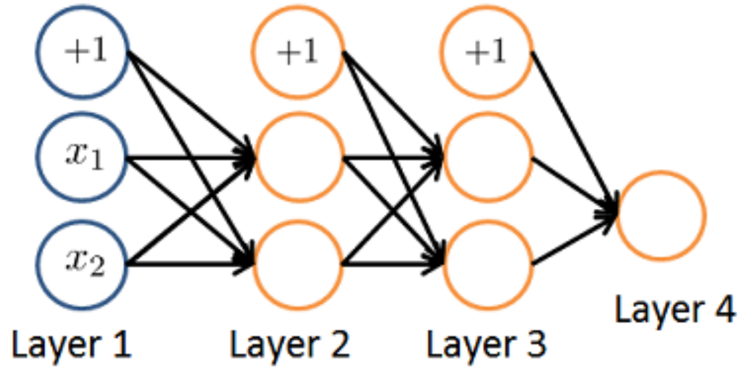
Consider the following neural network which takes two binary-valued inputs $x_1, x_2 \in \{0, 1\}$ and outputs $h_\Theta(x)$. Which of the following logical functions does it (approximately) compute?



Your Answer		Score	Explanation
XOR (exclusive OR)			
AND	✓	1.00	This network outputs approximately 1 only when both inputs are 1.
NAND (meaning "NOT AND")			
OR			
Total		1.00 / 1.00	

Question 2

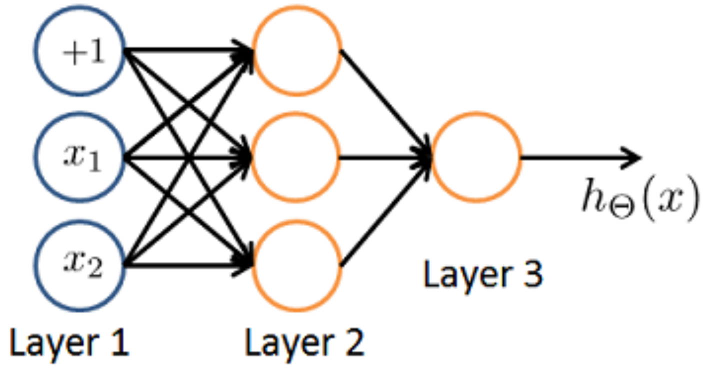
Consider the neural network given below. Which of the following equations correctly computes the activation $a_1^{(3)}$? Note: $g(z)$is the sigmoid activation function.



Your Answer	Score	Explanation
$a_1^{(3)} = g(\Theta_{1,0}^{(1)}a_0^{(2)} + \Theta_{1,1}^{(1)}a_1^{(2)} + \Theta_{1,2}^{(1)}a_2^{(2)})$		
$a_1^{(3)} = g(\Theta_{1,0}^{(2)}a_0^{(2)} + \Theta_{1,1}^{(2)}a_1^{(2)} + \Theta_{1,2}^{(2)}a_2^{(2)})$	1.00	This correctly uses the first row of $\Theta^{(2)}$ and includes the "+1" term of $a_0^{(2)}$.
$a_1^{(3)} = g(\Theta_{2,0}^{(2)}a_0^{(2)} + \Theta_{2,1}^{(2)}a_1^{(2)} + \Theta_{2,2}^{(2)}a_2^{(2)})$		
The activation $a_1^{(3)}$ is not present in this network.		
Total	1.00 / 1.00	

Question 3

You have the following neural network:



You'd like to compute the activations of the hidden layer $a^{(2)} \in \mathbb{R}^3$. One way to do so is the following Octave code:

```
% Theta1 is Theta with superscript "(1)" from lecture
% ie, the matrix of parameters for the mapping from layer 1 (input) to
layer 2
% Theta1 has size 3x3
% Assume 'sigmoid' is a built-in function to compute 1 / (1 + exp(-z))

a2 = zeros (3, 1);
for i = 1:3
  for j = 1:3
    a2(i) = a2(i) + x(j) * Theta1(i, j);
  end
  a2(i) = sigmoid (a2(i));
end
```

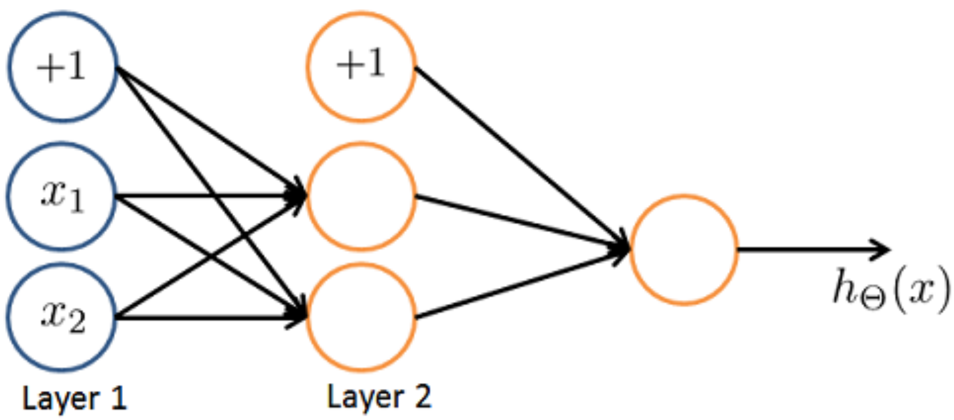
You want to have a vectorized implementation of this (i.e., one that does not use for loops). Which of the following implementations correctly compute $a^{(2)}$? Check all that apply.

Your Answer		Score	Explanation
☐ z = sigmoid(x); a2 = sigmoid (Theta1 * z);	✓	0.25	You do not need to apply the sigmoid function to the inputs.
☐ a2 = sigmoid (Theta2 * x);	✓	0.25	$\Theta^{(2)}$ specifies the parameters from the second to third layers, not first to second.
☑ z = Theta1 * x; a2 = sigmoid (z);	✓	0.25	This version computes $a^{(2)} = g(\Theta^{(1)}x)$correctly in two steps, first the multiplication and then the sigmoid activation.

z = sigmoid(x); a2 = Theta1 * z;		0.25	You should apply the sigmoid function after multiplying with $\Theta^{(1)}$, not before.
Total		1.00 / 1.00	

Question 4

You are using the neural network pictured below and have learned the parameters $\Theta^{(1)} = \begin{bmatrix} 1 & 2.1 & 1.3 \\ 1 & 0.6 & -1.2 \end{bmatrix}$ (used to compute $a^{(2)}$) and $\Theta^{(2)} = \begin{bmatrix} 1 & 4.5 & 3.1 \end{bmatrix}$(used to compute $a^{(3)}$} as a function of $a^{(2)}$). Suppose you swap the parameters for the first hidden layer between its two units so $\Theta^{(1)} = \begin{bmatrix} 1 & 0.6 & -1.2 \\ 1 & 2.1 & 1.3 \end{bmatrix}$ and also swap the output layer so $\Theta^{(2)} = \begin{bmatrix} 1 & 3.1 & 4.5 \end{bmatrix}$ How will this change the value of the output $h_\Theta(x)$?



Your Answer		Score	Explanation
It will increase.			
It will decrease			
It will stay the same.		1.00	Swapping $\Theta^{(1)}$ swaps the hidden layers output a^{(2)}. But the swap of $\Theta^{(2)}$ cancels out the change, so the output will remain unchanged.
Insufficient information to tell: it may increase or			

decrease.

Total	1.00 / 1.00

Question 5

Which of the following statements are true? Check all that apply.

Your Answer		Score	Explanation
☑ In a neural network with many layers, we think of each successive layer as being able to use the earlier layers as features, so as to be able to compute increasingly complex functions.	✓	0.25	Each layer computes a non-linear function of its input, so successive layers see more and more complex transformations of the original input.
☐ If a neural network is overfitting the data, one solution would be to decrease the regularization parameter λ.	✓	0.25	A smaller value of λ allows the model to more closely fit the training data, thereby increasing the chances of overfitting.
☐ A two layer (one input layer, one output layer; no hidden layer) neural network can represent the XOR function.	✓	0.25	We must compose multiple logical operations by using a hidden layer to represent the XOR function.
☑ Any logical function over binary-valued (0 or 1) inputs x_1 and x_2 can be (approximately) represented using some neural network.	✓	0.25	Since we can build the basic AND, OR, and NOT functions with a two layer network, we can (approximately) represent any logical function by composing these basic functions over multiple layers.
Total		1.00 / 1.00	