

## ECE661 Quiz 1

Name: \_\_\_\_\_ UniqueID: \_\_\_\_\_ Score: \_\_\_\_\_

This quiz is closed-book. By signing your name above, you agree to follow Duke Community Standard. For True/False and multiple-choice questions, no justification is needed.

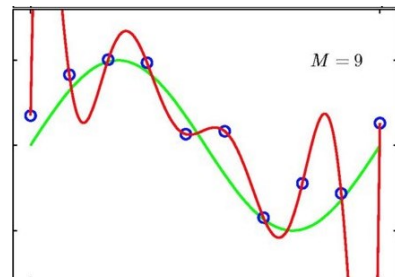
Here's some information you can refer to.

$$y = \text{Sigmoid}(z) = \frac{1}{1 + e^{-z}}$$

1. (1pt) (T/F) To predict whether it will rain tomorrow, we need a regression model.  
**False. Classification model.**
2. (2pt) (T/F) Generally, for a deep neural network only with fully connected layers and Sigmoid activation functions, I can replace those activation functions with more fully connected layers to achieve a similar performance.  
**False. Cannot break linearity. Consider  $x_{n+1} = W_n x_n + b_n = W_n(W_{n-1}(\dots(W_1 x_1 + b_1)\dots) + b_{n-1}) + b_n$ .  $x_{n+1}$  is still a linear combination of  $x_1$ . Thus, the model cannot represent well for non-linear functions.**
3. (2pt) (Multiple-Choice) For Sigmoid activation,  $dy/dz$  gets largest when its output  $y$  approaches \_\_\_\_\_.  
A. -1                      B. 0                      C. 0.5                      D. 1  
**C.  $dy/dz = y(1-y)$ . When  $y$  equals 0.5,  $dy/dz$  gets largest. Alternatively, given the curve of sigmoid function, the increase rate of  $y$  with respect to  $z$  gets largest when  $y=0.5$ .**
4. (2pt) (T/F) In most cases, we do both forward propagation and backward propagation at the training stage and only forward propagation at the inference stage.  
**True.**

5. (2pt) What's the issue with the right figure? **The green curve is the true function while the red curve is the trained model.**

\_\_\_\_\_  
**Overfitting.**



6. (1pt) To what degree do you think you are familiar with this course's content? 1-5 (open answer) Feel free to leave some comments. :)