EEL 4930/5934 – INTELLIGENT SYSTEMS

H.W. #1

Summer 2019 **Dr. Zilouchian**

1. Consider following the sigmoid function:

$$f(x) = \frac{1}{1+e^{-\alpha x}}$$

(a) What are the upper and lower limit of this function for constant α? Obtain the value of f(x) at x=0

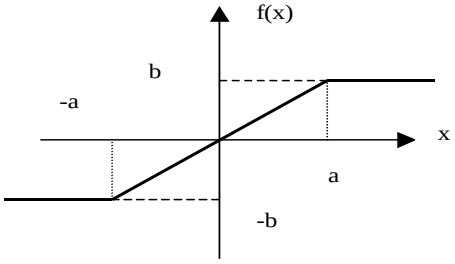
(b) Show that the derivative of f(x) with respect to x is given by:

$$\frac{df}{dx} = f'(x) = \alpha . f(x)[1 - f(x)]$$

(c) How would you modify f(x) such that its value at x=0 is equal (i) 0.15; (ii)0.8

(d) What is the value of f'(x) at the origin?

2. Consider the activation function f(x) shown below:



(a) Formulate f(x) as a function of x

(b) Obtain f(x) if either a or b or both are allowed to approach zero.

3. A neuron m receives sensory information from five inputs with the values of 8, -10, 4, -2 and 5. The synaptic weights of neuron m are 0.8, 2.0, 1.0, -0.9 and 0.6. Calculate the output of neuron for the following three situations:

(a) The neuron is a linear model

(b) The neuron is represent by a McCulloch-Pitts model. (Hard limit activation function with negative threshold zero)

(c) The neuron is represented based on a sigmoid function as follows:

$$f(x) = \frac{1}{1+\exp(-x)}$$