Problem set # 3.

As we saw in class, the cost function for logistic regression has the form

$$J(\theta) = \sum_{i\,=\,1}^{m} y^i \left[\; - \; \log\left(\; h_\theta \left(\; x^i \; \right) \; \right) \; \right] + \left(\; 1 \; - \; y^i \; \right) \left[\; - \; \log\left(\; 1 \; - \; h_\theta \left(\; x^i \; \right) \; \right) \; \right]$$

where $h_\theta(x) = \frac{1}{1+e^{-X\theta}}$ is a logit / sigmoid function.
To train the machine for classification problem, we implement the gradient descent method

$$\theta_j = \theta_j - \alpha \frac{1}{m} \sum_{i\,=\,1}^{m} \left(h_\theta \left(\; x^i \; \right) - y^i \right) x_j$$

where we update all the coefficients simultaneously.

Problem 1. Consider the data on the exam failure / success depending on the amount of hours studied that we saw in class; see the lecture slides.
1. Write your code for

- the sigmoid function;
- cost function for the logistic regression;
- hypothesis function for the logistic regression.

2. Find the solution to the classification problem by writing your own gradient descent method.
3. Find the solution to the classification problem by using MATLAB optimization routine.
Did you reproduce the results we saw in class?

Problem 2. Consider the data set that I include with the current home work.
1. Plot the data that I attached and mark them with dots / crosses or some other differing symbols.
2. Implement the logistic regression by using the software you wrote in Problem 1. What is your hypothesis here?
3. Implement the logistic regression by using the MATLAB software.