Download MARS toolbox for Matlab through the following URL: http://www.cs.rtu.lv/jekabsons/regression.html and unzip it in your working directory.

1. Use the data in spreadsheet "MARS HW Q1 data" in modules for this question. Find a MARS model. How many basis functions (including the intercept term)? Plot the result and show the equation.

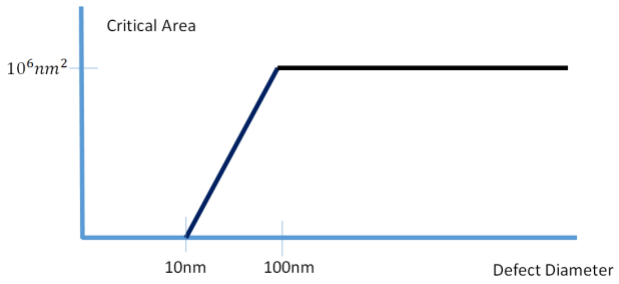
2. Use the data in spreadsheet "MARS HW Q2 data" in modules for this question. Find a MARS model. How many basis functions in the forward pass? How many basis functions (including intercept term) in the final model? Use arespredict() to generate your prediction $\hat{y} = f(t)$. Plot the training data and your prediction data.

Consider params = aresparams2('maxFuncs', 21, 'maxIneractions', 2) and params = aresparams2('maxFuncs', 21, 'maxInteraction', 2, 'yesInteract', [1,2], 'forceLinear', [4,5]). In the seconde case, only variable 1 and 2 can interact and variables 4 and 5 can enter the model linearly. Which is the best model? Why?

3. Suppose that your process is described by a standard normal random variable, i.e. x ~ N(0,1). Find the probability that $3 + 5x + 25x^2 + 12x^3 + x^4 + 14x^5 > 1000$ using importance sampling and a sample size of 100. Try sampling with a standard deviation of 2.

Probability = _____

4. A layer of a circuit has been designed with the critical area shown:



The defect size distribution is $f(x) = \frac{k}{x^3}$, where x is the defect diameter. $k = 10^{-4}\ defects * nm^3$. Find the average number of defects per chip and the layer yield. The critical area is expressed as an equation, as follows.

$$A(x) = \begin{cases} 0 & x < 10 \\ \frac{10^5}{9}x - \frac{10^6}{9} & 10 < x < 100 \\ 10^6 & x > 100 \end{cases}$$

Average number of defects per chip (λ) = _____

Layer yield = _____