


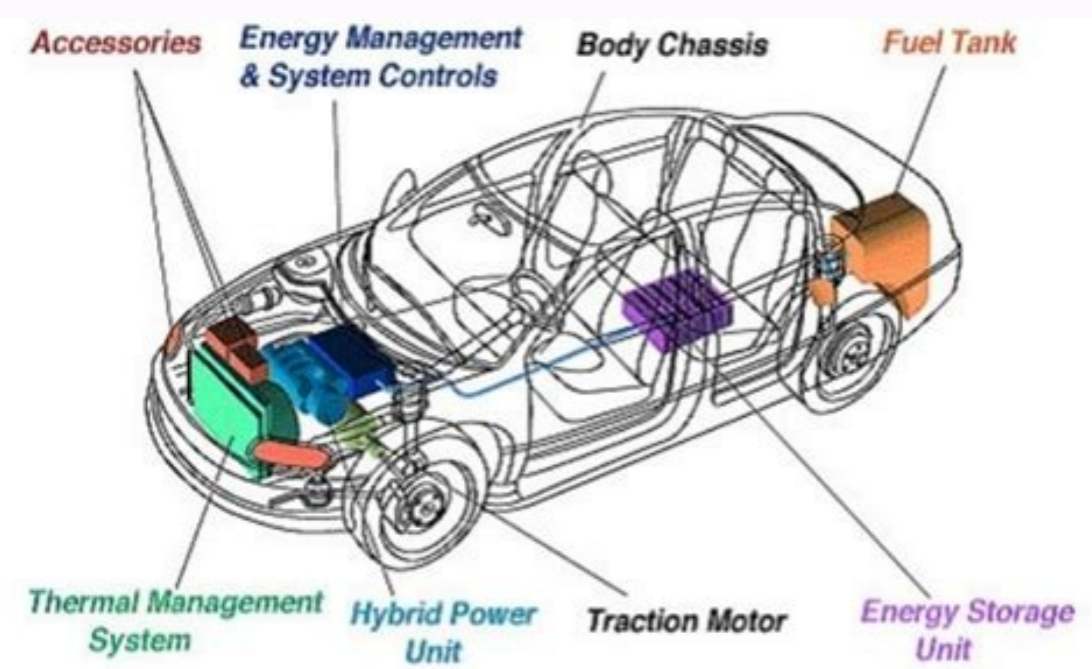
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# Ford Focus Mk2 User Manual

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Learning of the following function:

$$x_{n+1} = a * x_n * (1 - x_n)$$

with the initial condition  $x_0$  chosen in the interval  $[0,1]$  and  $a$  is a given parameter between 0 and 4.

This exercise is a simple model of population growth (discrete-time logistic growth) in a closed system with a finite amount of resources. The parameter  $a$  describes the rate of development and expansion of the population. The population is considered to be a continuous variable, which is the total population (rather than the population density), when  $a=1$  the population has reached its maximum sustainable level.

The population grows with the combined rate of reproduction (proportional factor  $a$ ) and the mortality rate (proportional factor  $1-x_n$ ). In other words, since the maximum size of the population is finite, the population will eventually reach a steady state.

1. Write a program for solving the logistic equation for the consecutive points of the sequence for  $n=1, \dots, 10$  and a random number between 0 and 1 for  $x_0$ . We assume in this problem that the maximum possible average population is 100, and the average population can be approximated by the initial amount of the population  $x_0$ .

2. Write a program to report the same sequence for 50 different random initial conditions, all different points of the parameter  $a$ ,  $a$  should be written into the function file.

3. Plot the result of the sequence for the same parameter  $a$  (10) for 50 different initial conditions of  $x_0$  (randomly chosen) for  $n=1, \dots, 10$ . We assume in this problem that the maximum possible average population is 100, and the average population can be approximated by the initial amount of the population  $x_0$ .

4. Plot the result of the sequence for the same parameter  $a$  (10) for 50 different initial conditions of  $x_0$  (randomly chosen) for  $n=1, \dots, 10$ . We assume in this problem that the maximum possible average population is 100, and the average population can be approximated by the initial amount of the population  $x_0$ .

5. Plot the result of the sequence for the same parameter  $a$  (10) for 50 different initial conditions of  $x_0$  (randomly chosen) for  $n=1, \dots, 10$ . We assume in this problem that the maximum possible average population is 100, and the average population can be approximated by the initial amount of the population  $x_0$ .

