5. Consider the following function:

$$Y = 37.684 - 15.315X + 3.095X^2 - 0.218X^3 + 0.005X^4$$

a. Plot this function on an X-Y graph for positive values of X from 1 to 20.
b. How many local maximum solutions are there?
c. How many local minimum solutions are there?
d. Use Solver to find the minimum value of Y using a starting value of $X = 3$. What value of Y do you obtain?
e. Use Solver to find the minimum value of Y using a starting value of $X = 18$. What value of Y do you obtain?

6. Refer to TMC's project selection problem presented in this chapter. In the solution shown in Figure 8.21, notice that the probability of success for project 4 is only 0.3488. Thus, project 4 is almost twice as likely to fail as succeed if it is assigned only three engineers. As a result, management might want to add a constraint to this problem to ensure that if a project is selected, it must have at least a 50% chance of succeeding.

a. Reformulate TMC's problem so that if a project is selected, it must have at least a 50% chance of succeeding.
b. Implement your model in a spreadsheet.
c. What is the optimal solution?

7. The PENTEL Corporation manufactures three different types of computer chips. Each type of chip requires different amounts of processing time in three different departments as summarized in the following table.

	Processing Hours Req'd per 100 Chips			
	Chip A	Chip B	Chip C	Hours Available
Dept 1	3	2	4	10,000
Dept 2	2	4	3	9,000
Dept 3	3	4	2	11,000

The total profit for each type of chip may be described as follows:

Chip A profit = $-0.35A^2 + 8.3A + 540$

Chip B profit = $-0.60B^2 + 9.45B + 1,108$

Chip C profit = $-0.47C^2 + 11.0C + 850$

where A, B, and C represent the number of chips produced in 100s.
a. Formulate an NLP model for this problem.
b. Implement your model in a spreadsheet and solve it.
c. What is the optimal solution?

8. A car dealership needs to determine how to allocate its $20,000 advertising budget. They have estimated the expected profit from each dollar (X) spent in four different advertising media as follows:

Medium	Expected Profit
Newspaper	$100X^{0.7}$
Radio	$125X^{0.65}$
TV	$180X^{0.6}$
Direct Mail	$250X^{0.5}$

If the company wants to spend at least $500 on each medium, how should it allocate its advertising budget in order to maximize profit?