(Two Companies) Two companies are producing widgets. It costs the first company dollars to produce widgets and the second company dollars to produce widgets. If a total of *q* widgets are produced, consumers will pay 300 − *q* dollars for each widget. If the two companies want to collude in an attempt to maximize the sum of their profits, how many widgets should each company produce? (The model for this type of problem is called a *collusive duopoly model*.)

**Discussion: -**

Our objective in this problem is to maximize the total profit. Profit function is nonlinear because it includes a squared cost term. Generally, when we are using software there is a chance that solver can get struck at a local optimum and never find the global optimum. To overcome this, we must define our objective as convex or concave functions depending the problem we are solving. As it is a maximization problem, we must make sure our objective function is concave, and if there is any constraint make sure that it is linear. In similar way, we will define convex function for minimization problem.

**Mathematical Model: -**

*Parameters (Inputs):*

*Decision Variables:*

*Objective:*

*Constraints:*

No Constraints

*Excel Implementation:* Please find the attached spreadsheet for solution. 

