1. Let us revisit the endogenous price model that you saw in the lectures for the oligopolistic case with Nash behavior on the part of producers with some slight modifications. Let the inverse demand function be given as $P = 40 - Q/4$, and let the unit cost function for all firms be given as $C(y) = 20 + y/2$. (I.e., total costs are $20 + y/2$.) Assume that there are five firms.

   a. Analytically derive the Nash equilibrium. What is the market price? What is total demand? What is output by each firm?

   b. Now set this problem up in GAMS as a mixed complementarity problem and solve it using GAMS to confirm your analytical work.

2. Now suppose that individual firms have different unit cost functions with intercepts equal to 10, 45, 5, 21, and 19, respectively, and common slope 1/2. (Notice that the slope is as it was in question 1/2 and the intercepts are equal to 20 on average, also as in question 1.)

   a. Now set this problem up in GAMS as a mixed complementarity problem and solve it using GAMS.

   b. What is the resulting market price? What is total demand? What is the output of each firm? With the heterogeneous cost structures, it is not surprising that production patterns vary across firms. What about the market results? Do they surprise you? Why, or why not?