### Final Exam

1. (20 points) The weekly demand for beer in Maltown is described by: $P = 1000 – 2Q$, where $Q$ is measured as the number of six-packs consumed each week and $P$ is the price of a six-pack. The marginal cost of producing a six-pack is constant at $8 and beer producers have no fixed costs.
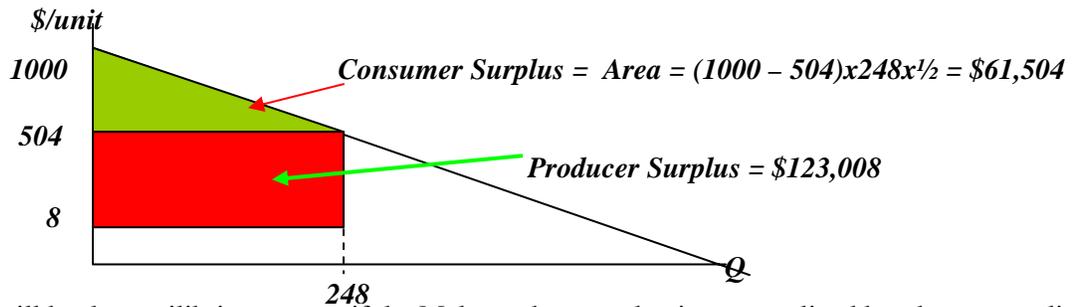
    a.   What is the equilibrium price and output if the Maltown beer market is perfectly competitive? What will the total amount of producer surplus in the competitive equilibrium? What will be the total amount of consumer surplus?

*In a competitive equilibrium, price equals marginal cost. Since Marginal Cost is 8, the competitive price must then be $8 as well. Setting P = 1000 – 2Q = MC = 8 and solving for Q yields an equilibrium output in a competitive market of Q = 496. Since Marginal Cost is constant it is the same as Average Cost. Accordingly, if Price = Marginal Cost it also equals Average Cost. Producer Surplus is therefore 0. Consumer surplus is given by the triangular area shown below and equal to $246,016.*



*Area = (1000 – 8)x496x½ = $246,016*
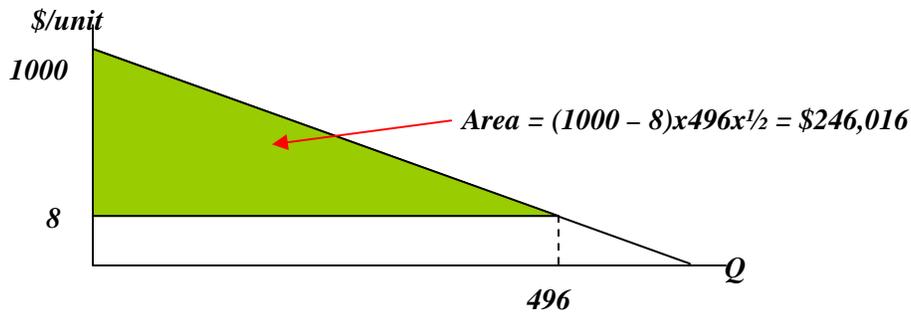
    b.   What is the equilibrium price and output if the Maltown beer market is monopolized and the monopolist charges a single, uniform price to all consumers? What will be the value of producer surplus in this case? What will be the value of consumer surplus?

*Profit maximization for a monopolist requires setting Marginal Revenue to Marginal Cost. For the monopolist, the Marginal Revenue curve is given by the "twice as steep" rule. Hence, MR = 1000 – 4Q. Setting this equal to the marginal cost of $8, then yields an equilibrium output under monopoly of Q = 248. From the demand curve, the price that this output will sell for is: P = 1000 – 2x248 = $504. Producer surplus or economic profit = (P – AC)Q = ($504 - $8)248 = $123,008. Consumer surplus is given by the triangular area shown below and is equal to $61,504.*



*Consumer Surplus = Area = (1000 – 504)x248x½ = $61,504*

*Producer Surplus = $123,008*

    c.   What will be the equilibrium output if the Maltown beer market is monopolized but the monopolist can perfectly price discriminate? What will be the value of producer surplus in this case? What will be the value of consumer surplus?

*The perfectly discriminating monopolist produces the same output as the perfectly competitive one. Hence, in this equilibrium, Q = 496. As each consumer is charged her maximum willingness to pay, consumer surplus is 0. All surplus now goes to the monopoly producer. As the answer to 1a) shows, this implies that producer surplus is $246,016.*

2. (20 points) The Tower of London is a store of great treasure.  It has been the seat of British government as well as the site of infamous political intrigue.  It has housed notorious traitors, virtuous members of court, lions, bears, and ravens.  Most famously perhaps, it has been and continues to be the repository of Britain's Crown Jewels.  Almost as well-known as Her Majesty's Tower are the Yeoman Warders often called the Beefeaters who guard the fortress.  It is an honor and a great privilege to serve as a Yeoman Warder.  Historically, it was also a great opportunity to enrich oneself at the public expense.  It seems that a few hundred years ago, when the Tower also served as the store for much of Britain's gold, many of the guards could not resist the temptation to steal the occasional gold coin out of the treasury. Of course, if a guard was caught stealing, the guard was summarily dismissed.   It seemed impossible though to watch the Beefeaters constantly and make sure that they never took anything.  To do that would require hiring a second layer of guards and that would be expensive.  Historians of the Tower have noted that shortly after this problem emerged, the Crown raised the basic pay of a Yeoman Warder to £7 per year, notably higher then the going market wage rate at that time of £5 per year.  Historians have also noted that to get a job as a Yeoman Warder it was not enough to apply.  One also had to pay a big, up-front fee, i.e., any successful applicant had to make a one-time payment right at the start if they were actually to be hired.

Comment on these developments.  Why do you think that the British government decided to pay above market wages to its Beefeaters?  Why do you think people paid to obtain Beefeater jobs? What other methods do you think the British monarchy might have used to achieve its objectives?

*This is an asymmetric information setting.  Each guard knows whether he or she is guilty of stealing.  No one else does.  Prevention of such stealing requires both some probability of being caught and some penalty if one is found out.  The probability of detection depends on monitoring but, as the story makes clear, monitoring is expensive.  Thus, to offset the low probability of being caught the Tower needs a rather severe penalty.  This is where the £7 salary comes into play.  As this is £2 or forty percent above the normal pay, this represents a very high premium paid to Beefeaters.  If one is caught stealing and loses this job, that premium is gone forever.  So, the role of the wage premium is to induce better behavior by Yeoman Guards.  However, if an honest fellow can earn £7 as a Beefeater but only £5 in other employment, then a lot of folk will want to be Beefeaters. By charging a fee to every successful job applicant, this diminishes the excess supply of would-be guards.  Presumably, the fee will be bid to a level that just reflects the present discounted value of £2 premium over the typical career span of a Yeoman Guard.  That is, the fee will be bid to the point such that it is equal to the discounted value of receiving an extra £2 each year for say 20 years.  Note how this fee acts as a further mechanism to bind the guard's interest to that of the Crown.  The only way to recoup the bond is to earn the wage premium for, again say 20 years.  In turn, this gives a great incentive to keep one's record clean and not steal.  Of course, this is not the only mechanism that the Crown might use.  It could, for example, set up a bonus system such that guards are paid normally £4 but get an extra £2 if no gold is stolen during their watch.  There are a variety of other potential contracts, as well.  All of these though must satisfy the incentive compatibility constraint and the participation constraint.  This is the trouble with a severe punishment for missing gold such as death or imprisonment (in the Tower of course).*

3. (20 points) In nearly each of the last 20 years, the faculty at Sloneybrook University has reviewed the course requirements that all of their students must fulfill to graduate.  Such reviews are initiated in the Committee on Academic Policy (CAP), which is comprised of representatives from each of the academic departments.  Proposed reforms typically include dropping some classes from the required list and adding in others.  Any reform that is proposed by the CAP is then voted on by the entire Sloneybrook faculty.  Yet despite this continuing effort, no major reform proposal has been adopted with the result that the set of courses required for the Sloneybrook degree has not changed in over two decades.  In chronicling this failure, outsiders have noted the following features of the Sloneybrook decision-making process:  a) departmental budgets and/or salaries are related to the number of students enrolled in departmental courses; b) there are a large number of required courses; c) faculty are risk averse; and d) the governance process is very inconsistent—the reform proposal that wins in one committee is later defeated in another committee or in a general faculty vote.

Use these observations and what you know about group decision-making to analyze briefly the failure of the Sloneybrook faculty to reform its graduation course requirements.

*First note the private interest of the faculty members. Because budgets and/or salaries are based on departmental size, individual faculty members have an incentive to make their own departments as large as possible. In turn, this creates an incentive to vote for graduation requirements in which classes in one's own department are among those required. With all faculty doing this, this perhaps explains why so many classes are required, especially when one considers vote trading. Department A support requiring Department B's courses in return for Department B's voting to require Department A's classes. Second, the fact that the faculty are risk averse may well give rise to a lot of inertia. The actual impact of any proposed change in the course requirements is likely to be uncertain. Freed from some requirements, students will take more of some classes but no one can be really sure what classes those will be. So, rather than take the chance, faculty may end up staying with the current requirements. This helps to explain why there has been no change in the requirements for so long. Finally, and relatedly, the fact that the process is inconsistent gives rise to further difficulty in changing the requirements. In turn, that inconsistency reflects the irrationality first noted by Condorcet. Once a committee settles on a proposed reform, a majority coalition forms that wants something else. This not only helps to explain the inconsistency it also gives another reason that the requirements have not changed for so long. Every time it looks like an agreement on new requirements is in sight, a new coalition forms to block it.*

4. (20 points) Imagine that Dry Gulch has two potential water suppliers. One is Northern Springs whose water is naturally carbonated but also somewhat "hard." The other is Southern Pellegrino whose water is crystal clear but not carbonated. The marketing department of each firm has worked out the following profit matrix depending on the price per 2 gallon container charged by each firm. Northern Spring's profits are shown as the first entry in each cell, e.g., if Northern Springs sets a price of 4 and Southern Pellegrino sets a price of 3, Northern Springs nets $25,000 in profits and Southern Pellegrino nets $30,000.

**Southern Pellegrino's Price is:**

|  |  | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
|  | 3 | 24,24 | 30,25 | 36,20 | 42,12 |
|  | 4 | 25,30 | 32,32 | 41,30 | 48,24 |
| **Northern Springs' Price Is:** | 5 | 20,36 | 30,41 | 40,40 | 50,36 |
|  | 6 | 12,42 | 24,48 | 36,50 | 48,48 |

a. Suppose that the two firms set their prices simultaneously. What is the (Nash) equilibrium?

*The Nash Equilibrium with simultaneous play is for both Southern Pellegrino (SP) and Northern Springs(NS) to set a price of $4 per 2 gallon container. In that case, each firm earns a profit of $32,000.*

b. Suppose that Northern Springs must set its price first, and stick with it, while Southern Pellegrino then reacts as best it can to the choice of Northern Springs. What is the price equilibrium in this case?

*If Northern Springs must set its price first and then stick with it, then it will announce a price of $6 per container. In response, Southern Pellegrino will set a price of $5 per container. Northern Springs will earn $36,000 in profit while Southern Pellegrino will earn $50,000.*

c. Does going first help or hurt Northern Springs?

*Both are better off than they are under simultaneous play. However, the first mover is, in this case, at a disadvantage relative to the second mover. Price games are different than output games. The problem with going first in a price game is that the follower can always come along and undercut one's price, thereby stealing customers and profit.*

5. (20 points)  Consider the following data on the relative price-cost markups for selected cars in different European Countries in 1997.  Here, the markup is measured as the percentage of the price by which the price exceeds an estimate of production cost, i.e., as the Lerner Index.  That is, the higher is the markup, the greater is the price above marginal cost.

| Model | Italy | UK | France | Germany | Belgium |
|---|---|---|---|---|---|
| Fiat Uno (Italy) | 21.7 | 8.7 | 8.7 | 9.8 | 7.6 |
| Nissan Micra (Italy) | 36.1 | 12.5 | 23.1 | 8.9 | 8.1 |
| Ford Escort (UK) | 8.9 | 11.5 | 9.5 | 8.9 | 8.5 |
| Peugeot 405 (France) | 9.9 | 11.6 | 13.4 | 10.2 | 9.5 |
| Mercedes 190 (Germany) | 15.6 | 12.3 | 14.4 | 17.2 | 14.3 |

Comment on these findings.  What patterns do you discern?  What economic reasoning might explain these patterns?

*Two features of the data are worth noting at the outset.  First, the markups are always lowest in Belgium. Second, each car tends to earn its highest markup in its home country.  Thus, the Italian cars, Uno and Micra, are marked up the most in Italy.  The Peugeot earns its highest markup in France.  The German Mercedes earns its highest markup in Germany and the Escort earns its highest markup in the UK. We know that the markup as measured by the Lerner Index reflects the elasticity of demand.  The greater is the elasticity of demand the smaller the markup.  So, the first thing that we can say is that none of these markets is perfectly competitive since, in that case, the markup would be zero.  Continuing with this logic, we might argue that Belgium has the most competitive new car market, since markups tend to be lowest there.  This may reflect a more open (freer) trading policy.  In this respect, note that Belgium has no domestic auto company to protect.  The clue to the second fact that car types tend to earn their highest margins in the country where they are made may also be expressed in terms of elasticity.  It may well be the case that residents of each nation are loyal to cars made in their home country.  Germans, for example, may well view a Mercedes as special and different from non-German made automobiles.  As a result, these other cars do not really offer a lot of competition to the Mercedes within the German border.  To put it somewhat differently, Mercedes has more monopoly power—less elastic demand—within Germany and so earns a higher markup there. The same might be argued for Fiat in Italy and Peugeot in France, etc.*