Practice Problems for Final Examination

Except for comments and additions in red font, the following is last year's final exam.

Instructions. In-class, closed book (except for the official formula sheet), no communications devices, 3 hours. Where insufficient information is provided, write down an explicit and reasonable assumption, and proceed. Points (pts) as marked; total is 100. Show calculations. You will receive full credit for correct numerical expressions that are roughly approximated (e.g., $\sqrt{24} \approx 5$), so calculators are unnecessary. You will receive generous partial credit for relevant but incomplete economic reasoning. No credit for rambling, however, so be brief. Be sure to write your name on each page you turn in.

1. Suppose that Anna makes risky choices as if maximizing the expected value of the Bernoulli function $u(m) = m^{2/3}$. She is faced with a situation in which she will receive either 0 (with probability 0.7) or 27 (with probability 0.3).

a. What is the expected (mean) outcome? Variance of outcome? (4pts)

b. What is Anna's certainty equivalent for this situation? What is the maximum amount she would be willing to pay an insurer to get the mean outcome for sure? (6pts)

c. What is Anna's coefficient of absolute risk aversion at the mean outcome? Her coefficient of relative risk aversion? (4pts)

2. Exams are either tough or easy; overall 60% are tough. Looking at the first two problems on the exam gives a clue: these problems seem tough 80% of the time when the exam is tough, and they seem tough only 10% of the time when the exam is easy.

a. What is the updated probability that the exam is tough, after seeing that the first two problems are easy? (6pts)

b. Would you find it psychologically comforting to know the day before whether the first two problems seem easy? (1pt) When would that information have economic value? (3pts)

3. Agil Corp recently launched a distinctive line of yambits. It finds that inverse demand for this product is $p = 80 - 2y$, while it can produce y units per month at cost $c(y) = 75+20y$.

a. What is the maximized profit, and corresponding price (p) and output (y)? (6pts)

b. Suppose Agil can charge different prices on different units sold. What is the largest profit that (absent obstacles) could then be obtained, and what is the corresponding output level? (3pts)

c. What practical considerations limit Agil's ability to profitably charge different prices on different units? What are some possible ways to deal with these considerations? (4pts)

d. Now assume that Agil must offer a unified price on all units sold each month. Suppose that there are no barriers to entry in the yambit business. What does standard (e.g., good undergrad level) economics predict regarding Agil's long run profit? Explain how the prediction works (e.g., in terms of shifts in the cost function or demand function). A diagram may help you make your points. (6pts)

4. Betamin Inc. currently sells $y = 10$ units per month of its main product at the prevailing price $p = 20$. When all firms in the industry shift their prices together, Betamin's inverse demand curve is well approximated by $p = 50 - 3y$. When rivals stay with the prevailing price, Betamin's inverse demand is approximately $p = 30 - y$. Its cost is $c(y) = 10 + 5y$.
Please turn over…

a. What are Betamin's own price elasticities at the prevailing price when only it shifts price? When all firms shift in parallel? (2pts)

b. Rivals offer a "not-undersold" policy in which they match the lowest price offered in the market if it is below p=20, and otherwise stay at p=20. Is it profit-maximizing for Betamin to continue to produce y=10 units per month? Show your calculations. (5pts)

c. Betamin's COO is worried that its cost function might shift, and asks you what sort of economic factors could change it. Please list the standard items. (3pts)

d. For what range of marginal costs and fixed costs would Betamin find it profit-maximizing for Betamin to continue to charge the prevailing price? (6pts)

The following problem draws on material (on externalities) not covered in 2017.

5. Demand in the ingot industry is $Y = 300 - 2p$. Supply is via 100 identical firms with production cost function $c(y_i) = 50y_i + 0.5y_i^2$. People who live in towns that produce ingots suffer health and other costs increasing in total output approximated by $e(Y) = 0.5Y^2$.

a. What is the industry supply curve (also known as the private MC function)? (2pts)

b. Find the competitive equilibrium output Y^c, and the corresponding total surplus $TS = PS + CS$. Assume that the costs $e(Y)$ are not included in producer surplus (PS) but are subtracted from consumer surplus (CS). (5pts)

b. What is the social MC function (which includes e as well as c costs)? (3pts)

c. Compute the output level Y^o that maximizes total surplus ($TS = PS + CS$). How much higher is TS here than at Y^c? (4pts)

d. What are the main possible approaches to restore efficiency? Name a specific policy that seems most effective in this example. (3pts)

6. Anyway Inc. and Belton Co. produce imperfectly substitutable products, with inverse demand $p_A = 8 - q_A - 0.5q_B$ for Anyway and $p_B = 8 - q_B - 0.5q_A$ for Belton, where q_A and q_B denote their respective output quantities. They have cost functions $c(q_i) = 2 + 3q_i$, for i=A,B. Both firms choose quantity simultaneously and independently.

a. Find the best response functions for both firms. (4pts)

b. Find Nash equilibrium outputs, prices and payoffs (profits). (4pts)

c. What is each firm's conjectural variation? What actual variation do the BR functions imply (e.g., dBR_B/dq_A)? (4pts)

d. Now assume that both firms choose price (not quantity) simultaneously and independently. What now are their best response functions? NE prices, outputs and payoffs? Conjectural and implied actual variations? (6pts)

e. Now suppose that they are able to form a cartel. What is the maximized total profit for the two firms? What are the corresponding prices and outputs? What are the corresponding conjectural variations? (6pts)

For additional problems on oligopoly, see Varian, e.g., problem 16.10. You could also try 16.11, whose answer is in the back of the book. Below is a routine problem on monopolistic competition.

7. If your firm has cost function $c(y) = 104 - 14y + y2$ and faces demand function $y = 10 - 2p$,

a. what is the profit-maximizing price, output level, and maximum profits?

b. if there is free entry to your industry, what changes (to price, output, and profit) do you expect in the long run?