

EC3322
Industrial Organization I
Semester 1, 2015-2016
Tutorial #5
SOLUTIONS

2. a

3. (a) First, set up the profit function:

$$\pi = z(1 - q)q - z^2q.$$

Then, derive the first-order conditions:

$$\frac{\partial \pi}{\partial z} = (1 - q)q - 2zq = 0 \quad \text{and} \quad \frac{\partial \pi}{\partial q} = z(1 - 2q) - z^2 = 0.$$

Solve to find that $z^* = q^* = 1/3$. Substitute z^* and q^* into the inverse demand function to find price $p^* = 2/9$.

(b) Consumer surplus is

$$CS = \frac{1}{2} \cdot \left(\frac{1}{3} - \frac{2}{9} \right) \cdot \frac{1}{3} = \frac{1}{54}.$$

Profit is

$$\pi = \frac{1}{3} \cdot \frac{2}{9} - \left(\frac{1}{3} \right)^2 \cdot \frac{1}{3} = \frac{1}{27}.$$

(c) To find the socially optimal quality at $q = 1/3$, first derive total welfare as total gross benefit minus total cost of production:

$$W = \frac{1}{2} \cdot \frac{1}{3} \cdot \left(z + \frac{2}{3}z \right) - \frac{1}{3} \cdot z^2 = \frac{5}{18}z - \frac{1}{3}z^2.$$

Maximize to find z^W :

$$\frac{dW}{dz} = \frac{5}{18} - \frac{2}{3}z = 0 \Rightarrow z^W = \frac{5}{12}.$$

4. (a) The first action of each strategy of player 2 is the action taken if player 1 plays D .
The second action is player 2's action if player 1 plays U .

		Player 2			
		L,L	L,R	R,L	R,R
Player 1	D	3,1	3,1	0,0	0,0
	U	5,0	0,1	5,0	0,1
	X	2,2	2,2	2,2	2,2

- (b) There are two Nash equilibria: $(D, (L, R))$ and $(X, (R, R))$
5. (a) The N.E. is Firm 1 plays Passive and Firm 2 plays Aggressive.
- (b) Firm 1 would choose Aggressive and firm 2 would choose Passive.