

1) Voting on the funding for the Syracuse City School District. Syracuse faces a substantial decline in state funds due to the economic crisis. It is voting on how many teachers to cut. It can issue bonds to earn some money to fill the funding gap. We are voting on the budget and bond strategy. Our options are:

- Low Budget, No bonds – low cost budget, 700 teacher jobs lost
- Medium Budget, Low Bonds – medium cost budget, 250 jobs lost
- High Budget, High Bonds – highest budget, no teacher jobs lost

Four groups in society:

- Moderates, who prefer Medium, to High, to Low (30%)
- Fiscal Conservatives, who prefer Low, then Medium, then High (35%)
- People with kids enrolled in the city schools, who prefer High, to Low, to Medium (30%)
- Teachers, who prefer High, to Medium, to Low (5%)

Preferences over Budget Levels				
	First Choice	Second Choice	Third Choice	Percent of the vote
Moderates	Medium	High	Low	30%
Fiscal Conservatives	Low	Medium	High	35%
Effective Schoolers	High	Low	Medium	30%
Teachers	High	Medium	Low	5%

For each agenda, describe the voting in each round and the final outcome.

a. Agenda A: Compare High to Low, then winner takes on Medium

<p>H vs L</p> <table style="width: 100%;"> <tr> <td>M 30% H</td> <td>FC 35% L</td> </tr> <tr> <td>ES 30% H</td> <td></td> </tr> <tr> <td>T 5% H</td> <td></td> </tr> <tr> <td style="border-top: 1px solid black;">65% H</td> <td>35% L</td> </tr> </table> <p style="text-align: right; font-size: 2em;">(H)</p>	M 30% H	FC 35% L	ES 30% H		T 5% H		65% H	35% L	<p>H vs M</p> <table style="width: 100%;"> <tr> <td>M 30% M</td> <td>ES 30% H</td> </tr> <tr> <td>FC 35% M</td> <td>T 5% L</td> </tr> <tr> <td style="border-top: 1px solid black;">65% M</td> <td>35% H</td> </tr> </table> <p style="text-align: right; font-size: 2em;">(M)</p>	M 30% M	ES 30% H	FC 35% M	T 5% L	65% M	35% H
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65% H	35% L														
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65% M	35% H														

b. Agenda B: Compare Medium versus Low, winner takes on High

<p>M vs L</p> <table style="width: 100%;"> <tr> <td>M 30% M</td> <td>FC 35% L</td> </tr> <tr> <td>ES 30% L</td> <td></td> </tr> <tr> <td>T 5% M</td> <td></td> </tr> <tr> <td style="border-top: 1px solid black;">35% M</td> <td>65% L</td> </tr> </table> <p style="text-align: right; font-size: 2em;">(L)</p>	M 30% M	FC 35% L	ES 30% L		T 5% M		35% M	65% L	<p>L vs H</p> <table style="width: 100%;"> <tr> <td>M 30% H</td> <td>FC 35% L</td> </tr> <tr> <td>ES 30% H</td> <td></td> </tr> <tr> <td>T 5% H</td> <td></td> </tr> <tr> <td style="border-top: 1px solid black;">65% H</td> <td>35% L</td> </tr> </table> <p style="text-align: right; font-size: 2em;">(H)</p>	M 30% H	FC 35% L	ES 30% H		T 5% H		65% H	35% L
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c. Agenda C: Compare High versus Medium, winner takes on Low

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2) Market structure and externalities. The inverse demand curve is given as $p=116-2q$. The supply curve is $p=20+2q$.

- a. What is the equilibrium price quantity pair if the market structure is perfectly competitive?

$$116 - 2q = 20 + 2q$$

$$96 = 4q$$

$$q = 24$$

$$p = 68$$

$$\begin{array}{r} 24 \\ 4 \overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

$$\begin{array}{r} 48 \\ 20 \\ \hline 68 \end{array}$$

- b. If there is a marginal externality generated by production of the good equal to $4*q$ ($MC^E=4*q$), what is the socially optimal price quantity pair?

$$116 - 2q = 20 + 2q + 4q$$

$$116 - 2q = 20 + 6q$$

$$96 = 8q$$

$$q = 12$$

$$p = 92$$

$$\begin{array}{r} 12 \\ 8 \overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

$$p = 116 - 2(12)$$

$$= 116 - 24$$

$$\begin{array}{r} 116 \\ -24 \\ \hline 92 \end{array}$$

- c. What size specific Pigovian tax τ could be placed on producers to arrive at the socially optimal outcome?

$$\bar{L} = MC^E(q^{so}) = 4(12) = 48$$

- or -

$$92 = 20 + 2q + \bar{L}, \quad q = 12$$

$$92 = 20 + 2(12) + \bar{L}$$

$$92 = 20 + 24 + \bar{L}$$

$$92 = 44 + \bar{L}$$

$$92 - 44 = \bar{L}$$

$$\bar{L} = 48$$

$$\begin{array}{r} 81 \\ 92 \\ -44 \\ \hline 48 \end{array}$$

3) Cost.

a. Complete the following table.

Total Output	Fixed Cost	Total Cost	Variable Cost	Average Variable Cost	Average Fixed Cost	Average Cost	Marginal Cost
0	8	8	-----	-----	-----	-----	-----
1	8	21	13	13	8	21	13
2	8	36	28	14	4	18	15
3	8	51	43	14 1/3	8/3	17	15
4	8	68	60	15	2	17	17
5	8	88	80	16	8/5	17.6	20

b. Is this short run or long run cost information? Why?

SR \exists FC

c. If market price for the output produced is 17, what level of output is profit maximizing for a firm if the market structure is perfectly competitive?

$$P = MC @ Q = 4.$$

$$\pi = 17(4) - 68$$

$$68 - 68 = 0$$

$$17 = P \geq AVC(4) = 15$$

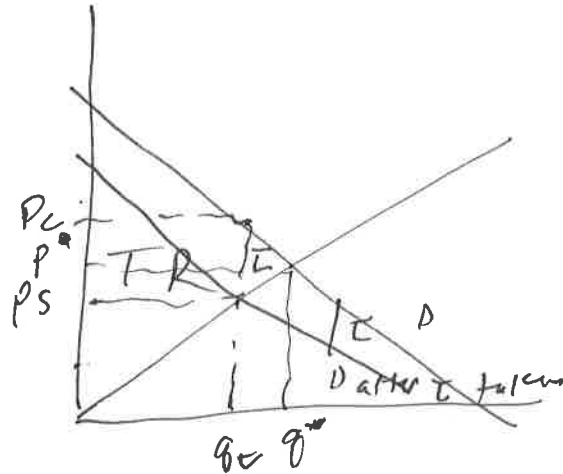
$$\pi(4) = 0$$

$$\pi(0) = -8$$

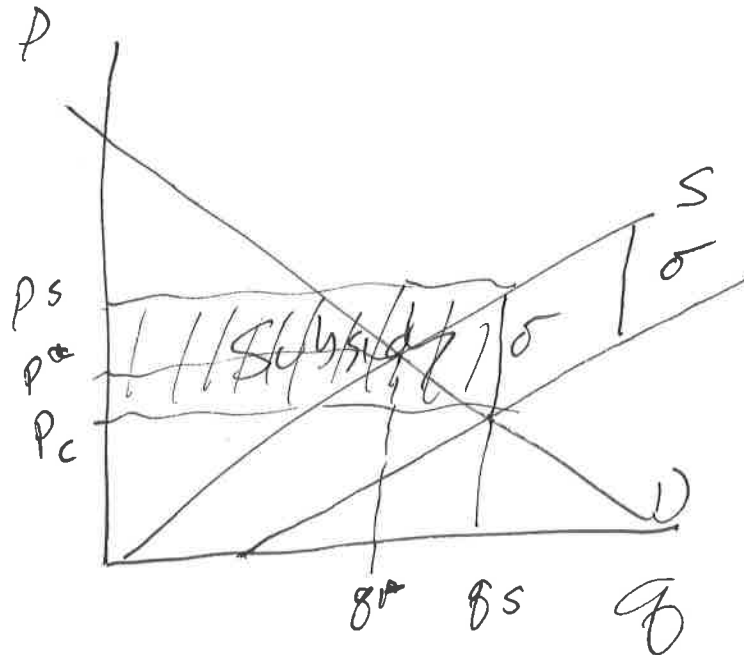
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4) Taxes and Subsidies

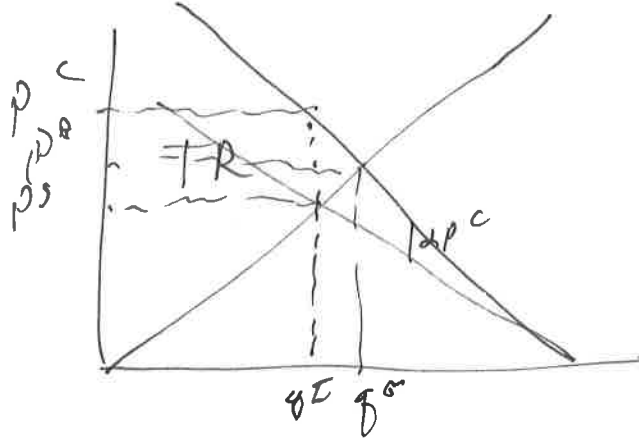
- a. Show the impact of a specific tax of size τ per unit placed on consumers. Note the price paid by consumers, the price received by producers, the equilibrium quantity and the tax revenue, and contrast this to the pre-tax price quantity pair.



- b. Show the impact of a subsidy of size σ per unit paid to producers. Note the price paid by consumers, the price received by producers, the equilibrium quantity and the total size of the subsidy, and contrast this to the pre-subsidy price quantity pair.



- c. Show the impact of an ad valorem tax rate α placed on consumers. Note the price paid by consumers, the price received by producers, the equilibrium quantity and the tax revenue, and contrast this to the pre-tax price quantity pair.



- d. Provide an example of a policy issue where a tax such as the one you drew for part (a) would be an appropriate policy response.

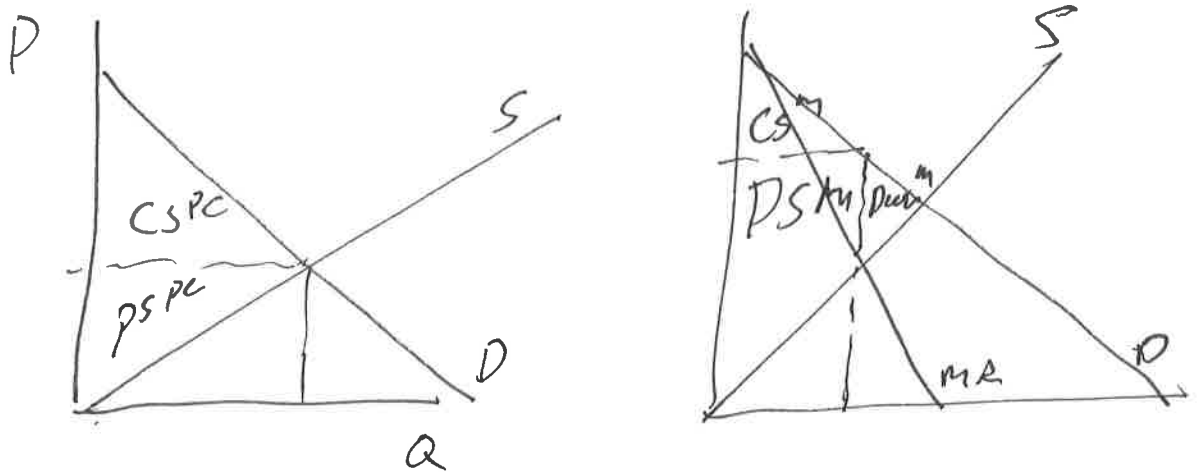
Negative externality

- e. Provide an example of a policy issue where the subsidy such as the one you drew in part (b) would be an appropriate policy response.

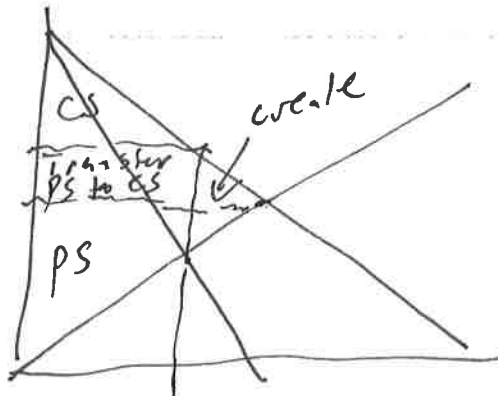
Positive externality

5) Monopoly.

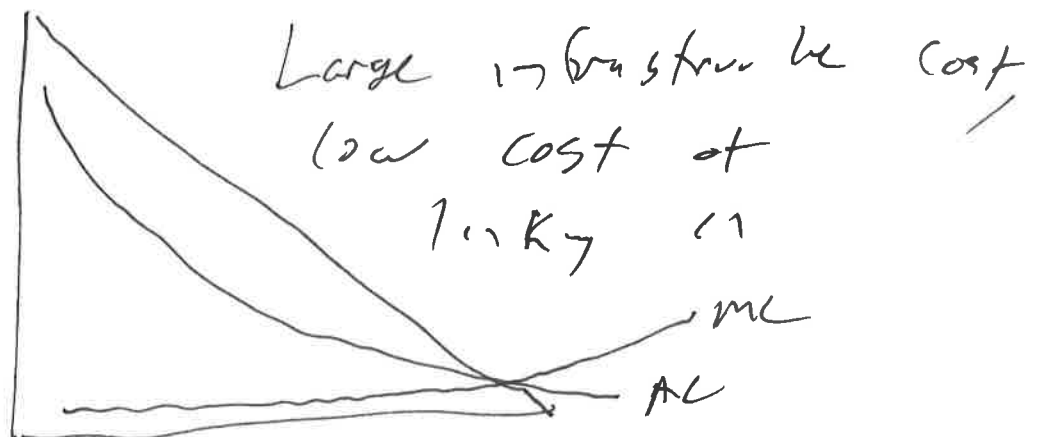
- a. Illustrate on a graph the difference between a monopoly outcome and a perfectly competitive market outcome. Identify areas corresponding to producer surplus, consumer surplus, and deadweight loss.



- b. Contrast the monopoly outcome with the outcome of breaking up the monopoly to arrive at a perfectly competitive outcome in terms of the transfer of economic benefit and the creation of economic benefit.



- c. What is a natural monopoly and why is it likely to occur in (for example) residential energy delivery?

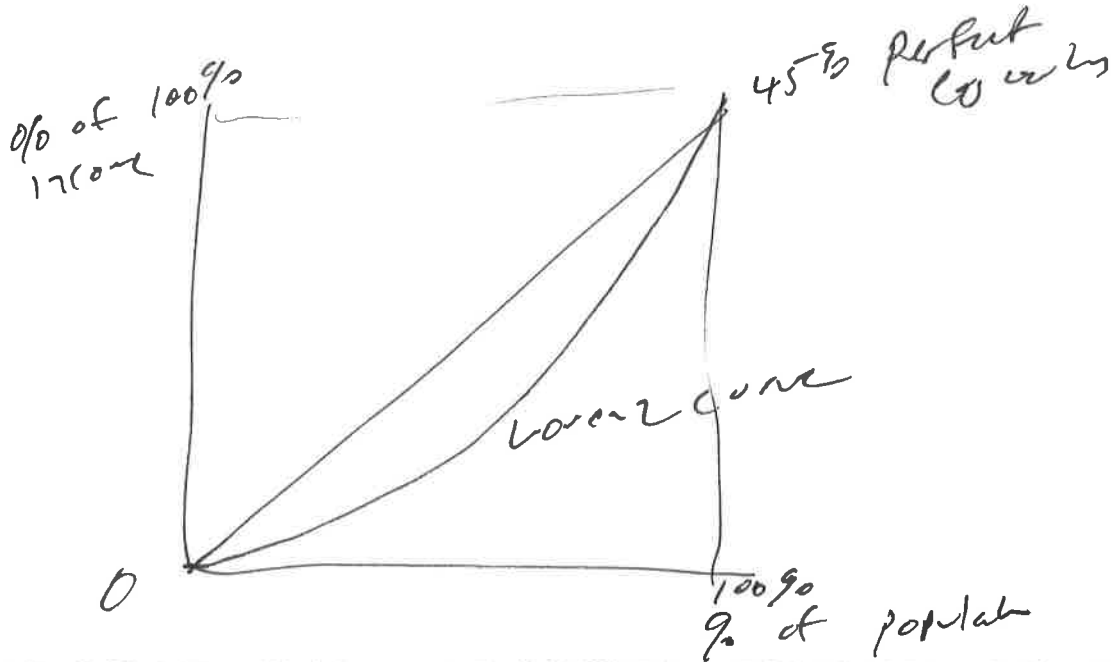


6) Circle the correct answer.

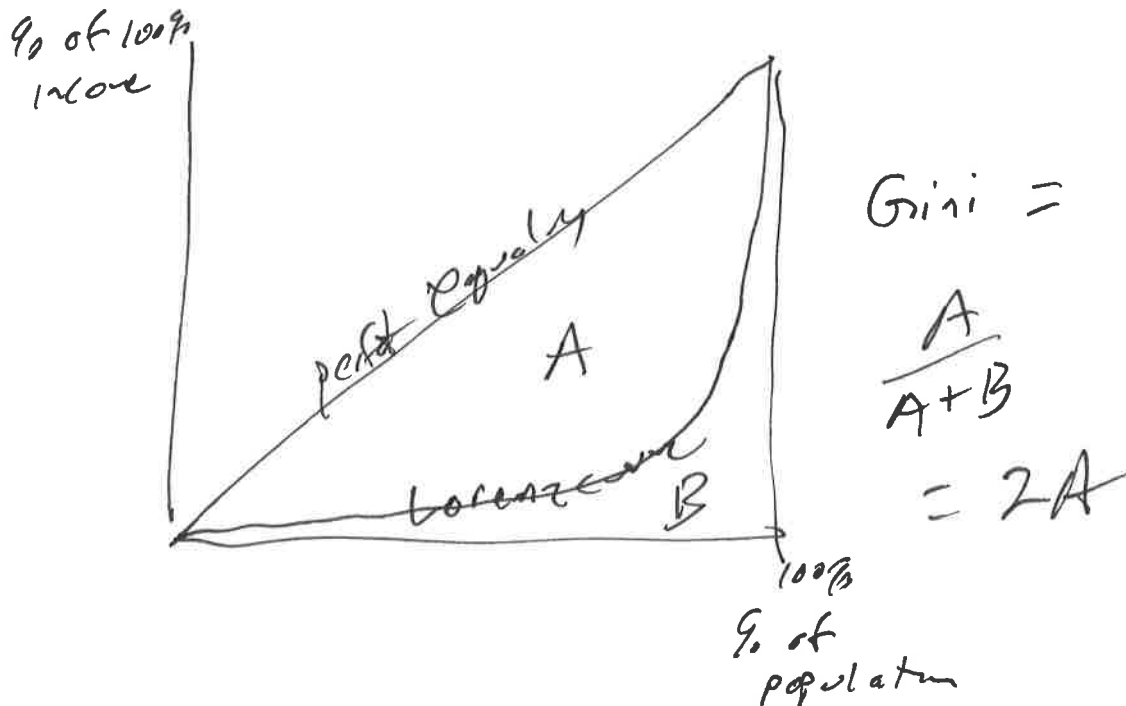
Statement	The statement is (circle the correct answer)	
The expansion path traces out all points that are economically efficient.	True	False
Producer surplus is calculated as the area below the demand curve and above the price line.	True	False
A Nash Equilibrium is where to players are playing best response to each other.	True	False
The societal demand curve for a public good is derived by adding up the quantity demanded by each member of society at a given price.	True	False
Private goods are non-rival and non-excludable.	True	False
Increasing returns to scale occur when $2 \cdot f(K, L) > f(2 \cdot K, 2 \cdot L)$	True	False
Coase argued that externality problems lead to sub-optimal outcomes for society due to a failure to assign property rights.	True	False
Economic efficiency is a necessary but not sufficient condition for technological efficiency.	True	False
The cost minimizing point on an isoquant is where $\frac{MP_L}{MP_K} = \frac{w}{r}$	True	False
A Gini coefficient for the distribution of income increases from 0.5 to 0.6 over a ten year period. This indicates income inequality is increasing over the ten year period.	True	False

7) Income inequality.

- a. Draw a Lorenz curve for the distribution of income in a given country and contrast it to a line representing perfect equality in the distribution of income in that country.

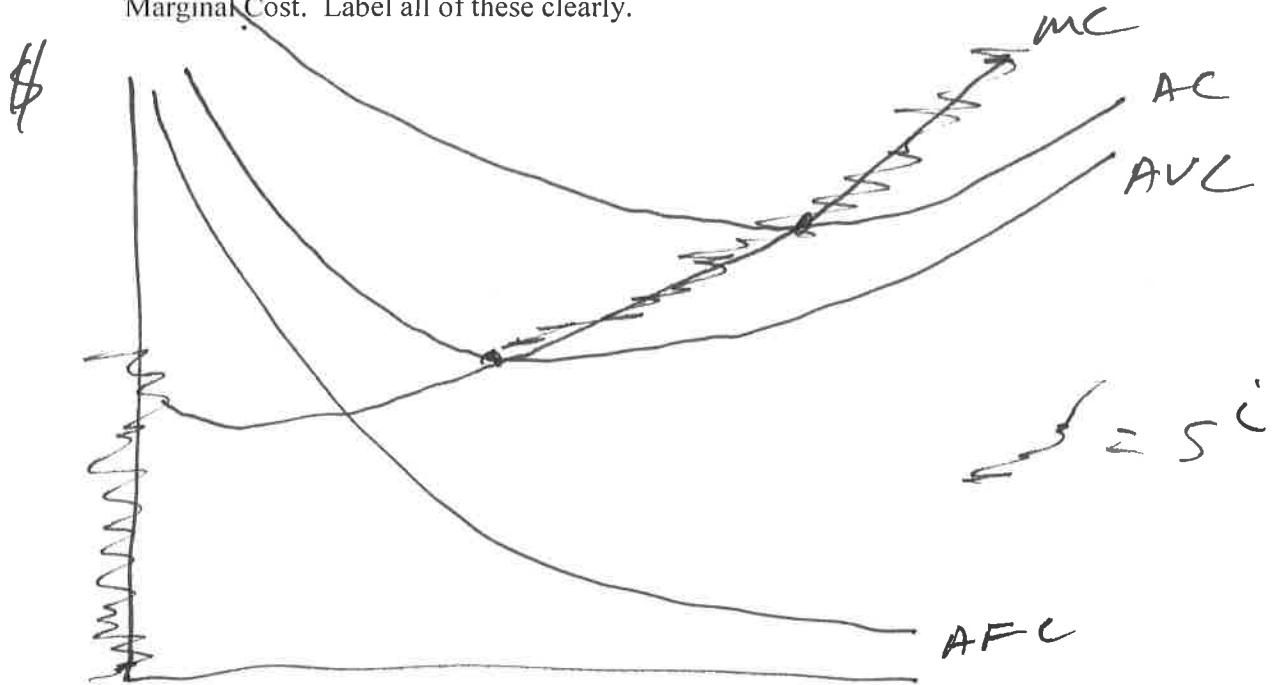


- b. Illustrate how to compute a Gini coefficient on a Lorenz curve that reflects a more unequal distribution of income than what you drew for (a).

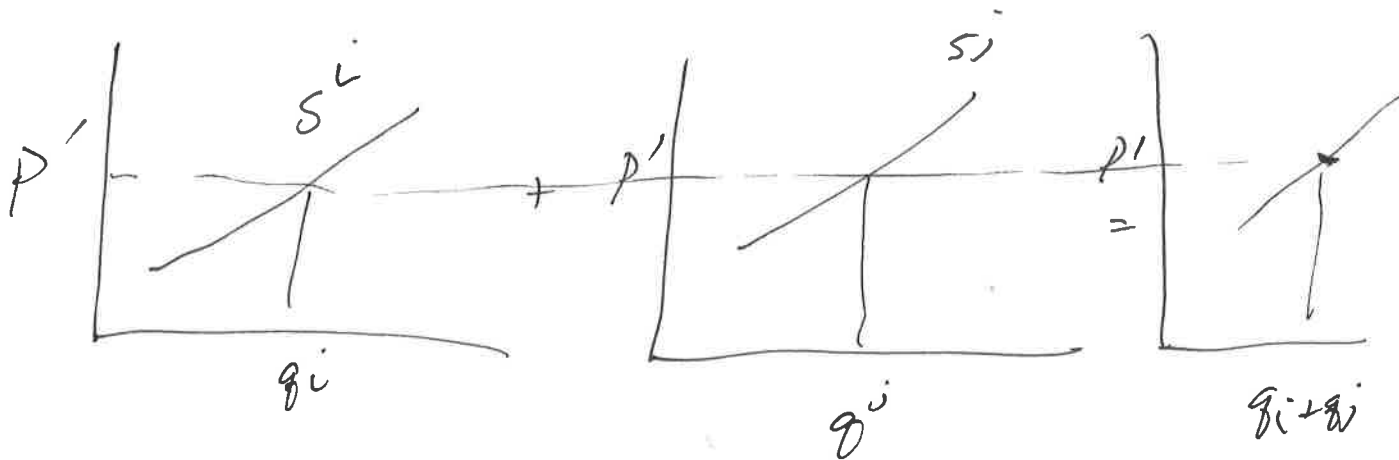


8) Supply curve.

- a. Illustrate on a graph how you can derive a firm's short run supply curve. Illustrate using Average Fixed Cost, Average Variable Cost, Average Cost, and Marginal Cost. Label all of these clearly.



- b. How is the supply curve for a market related to the supply curve for the firm you drew in part (a)?



9) Public goods. There are three people who live in a town. They each have a demand curve for the number of bales of hay to put in front of the light poles at the bottom of the sledding hill (to soften the impact of crashing into the light poles after sledding down the hill). Jessie's demand is $8-q$. Danny's demand is $20-2q$. Joey's demand is $8-2q$.

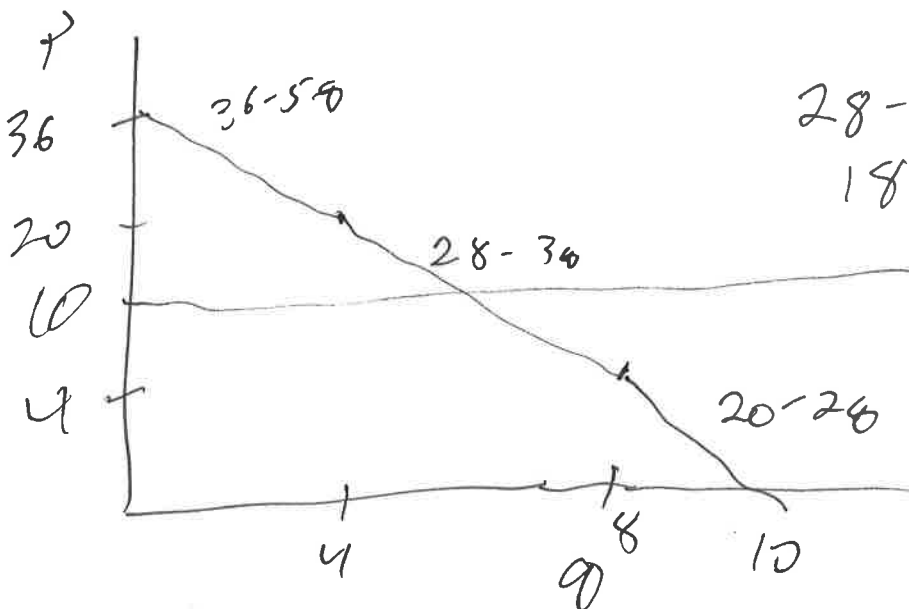
- a. If the marginal cost of a bale of hay is \$10 and no effort is made to avoid the free rider problem, what number of hay bales will be provided and who will provide it?

$$\begin{aligned} J: & 8-q, q=8, WTP=0 \\ D: & 20-2q, q=10, WTP=0 \\ J: & 8-2q, q=4, WTP=0 \end{aligned}$$

$$\begin{aligned} 36-5q & \text{ to } 4 \\ 28-3q & \text{ to } 8 \text{ Danny} \\ 20-2q & \text{ to } 10 \end{aligned}$$

$$\begin{aligned} 20-2q & = 10 \\ 10 & = 2q \\ q & = 5 \end{aligned}$$

- b. How much less is this than the socially optimal number of hay bales if the price of a bale of hay is \$10?



$$\begin{aligned} 28-3q & = 10 \\ 18 & = 3q \\ q & = 6 \end{aligned}$$

$$q = 6$$

not
(36-5q=10)

$$26=5q \quad q=5\frac{1}{5}$$

10) There is one pasture two herders share in common. Milk produced on this pasture is determined by the combined herd of the two herders. Milk production is a function of total herd size is as follows:

# of animals	Liters of milk produced
0	0
1	10
2	19
3	27
4	34
5	40
6	45

For each livestock owner, the share of this total milk produced they receive is a function of your share of the total herd. The cash value of milk is \$1 per liter.

For each animal put on the pasture, it costs \$6 in private labor costs.

As before in class, then, payoffs are defined by the following equations.

$$\Pi_1 = \$1 * \frac{h_1}{h_1 + h_2} f(h_1 + h_2) - \$6 * h_1, \quad \Pi_2 = \$1 * \frac{h_2}{h_1 + h_2} f(h_1 + h_2) - \$6 * h_2$$

The profits for each herder are as written in each cell of the table below.

		Herder 1						
		0	1	2	3			
Herder 2	0	0	0	4	0	7	0	9
	1	4	0	3.5	3	6	2.5	7.5
	2	7	0	6	5	5	4	6
	3	9	0	9.5	2.5	6	4	4.5

a) What is the full set of best response strategies for each herder?

If H1 0 H2 3
 If H1 1 H2 3
 If H1 2 H2 3
 If H1 3 H2 3
 If H2 0, H1 3
 If H2 1, H1 3
 If H2 2, H1 3
 If H2 3, H1 3

b) What is the Nash Equilibrium outcome of this game?

H1 3, H2 3 (4.5, 4.5)

c) Propose one policy solution to Pareto improve on the Nash Equilibrium outcome, explaining what it means to Pareto improve in your answer.

quantity restricted to 2 animals each,
 move from 9 to 10 total (Pareto
 optimal) in a way that makes at least
 one person better off without making
 anyone worse off (Pareto improve)

