Final   Name: _____
PAI 723, Fall 2012

The total final is worth 30 points. Each question is worth 2 points, and each sub question is worth an equal share of the 2 points.

1) A food stamp policy is put in place in a state. The initial budget constraint is $y = p_f \cdot f + p_o \cdot o$, where f is food, o is all other goods, and the two prices are subscripted by their commodity.   For our representative consumer impacted by this policy, their initial income y = \$2000 is supplemented by a cash value of food stamps of \$200. The price of food is \$10 per unit, the price of the other good is \$20 per unit.

        a. Draw the original budget line and the budget line after the food stamp policy is implemented.

        b.   Reproduce your graph for (a), and then place on the graph indifference curves for a consumer who is made **equally well off** if we give the consumer \$200 in food stamps or \$200 in cash.

2) If $p_1 = \$5$, $p_2 = \$10$, and $Y = \$400$
   a. Draw the budget constraint.

   b. Show how you can derive the price consumption curve for a given consumer's preferences (drawn as you like so long as they obey the properties of indifference curves discussed in class) using the example of the budget line from (a) with $p_1 = \$5$, with $p_1 = \$4$ all else constant, and with a budget line of $p_1 = \$10$ all else constant.

   c. Show how to derive the individual's demand curve from the graph in (b).

3) Market structure and externalities. The inverse demand curve is given as $p=130-4q$. The supply curve is $p=10+4q$.

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

    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?

    c. If the market structure is a monopoly who takes no account of the cost of the externality, what is the equilibrium price quantity pair chosen by the monopolist?

4) Production functions.

a) Draw the production function $Q=f(L, \bar{K})$ noting areas that are not feasible, not efficient and at the frontier of technological efficiency.

b) Show what technological progress looks like on a production function such as the one you drew for (a)

c) Draw an isoquant of the production function $Q=f(L, K)$ noting areas that are not feasible, not efficient and at the frontier of technological efficiency for producing a target production level Q'.

5) Circle the correct answer

Condition A	Condition B	What type of condition is B for establishing A?
MC is below AVC at q	AVC is downward sloping at q.	N, NS S, NN N,S
No transaction costs	The market is perfectly competitive	N, NS S, NN N,S
The market is perfectly competitive	No transaction costs	N, NS S, NN N,S
Consumption of the good is characterized by rivalry.	The good is a private good	N, NS S, NN N,S
The good is a public good.	The good is characterized by non-exclusion	N, NS S, NN N,S
The quantity is produced in a technologically efficient way	The quantity is produced in an economically efficient way	N, NS S, NN N,S
A quantity is the profit maximizing quantity	The quantity is produced in a technologically efficient way.	N, NS S, NN N,S
The last dollar rule is satisfied at a bundle	MRS=MRT at a bundle	N, NS S, NN N,S

N,NS :   Necessary, not sufficient
S, NN: Sufficient, not necessary
N, S: Necessary and sufficient.

6) Types of Goods.
a) What type of good goes in which blank?

	Rival	Non Rival
Exclusion		
Non Exclusion		

b) Illustrate how deriving the aggregate demand curve for a public good differs from deriving the demand curve for a private good, and explain how this difference relates to your answers to (a).

Aggregate demand for a private good:

Aggregate demand for a public good:

7) Benefit cost.

We are comparing two policies to reduce CO_2 emissions in our country. Both policies under consideration provide a flow of health benefits over the next four years (t=0,1,2,3) that are equal to 5 million in present value through reduced pollution. In addition, both policies lead to an increase in carbon sequestration that provides revenues from the sale of carbon credits on international markets of 2 million each year for t=1, t=2, and t=3.

 The 'vehicle' policy option would be a four year (t=0, t=1, t=2,t=3) program that would cost 4 million in t=0, 3 million in t=1, 2 million in t=2, and 2 million in t=3. This would replace all vehicles in the country over ten years old and replace them with lower emission vehicles.

The 'industry' policy option would be a four year (t=0, t=1, t=2, t=3) program that would cost 7 million in t=0, 2 million in t=1, 1 million in t=2, and 1 million in t=3.

a) If the discount rate is 10%, which policy is a better option in net present value terms?

b) Note that the sum of the benefits, the sum of the costs for 'vehicle' and the sum of the costs for 'industry' each add up to 11 million over four years. Explain how the pattern of benefits and costs over time plus the role of discounting allowed you to select one option over the other in part (a).

8) Public goods.
a. There are three people who live in a town. We are considering the demand for the number of hectares of public parkland, where q is the hectares of park area accessible to all three people. Dora's demand is defined by 90-q. Isa's is defined by 30-3*q. Benny's is defined by 150-q. What is total marginal willingness to pay on the societal demand curve for the provision of the 20th hectare of parkland?

b. If the marginal cost of public parkland provision is constant at 100 per hectare and no effort is made to avoid the free rider problem, what number of hectares of park land will be provided and who will provide it? How many hectares less is this than the socially optimal level at this cost of provision per hectare?

9) Tax policy.

a. Illustrate on a supply and demand graph a specific tax of size τ placed on producers.

b. Illustrate on a supply and demand graph the impact of an ad valorem tax rate α placed on consumers.

c. Explain the concept of consumer incidence based on your graph in part (b). Note in your answer what economic concepts determine the size of consumer incidence.

10) Syracuse is considering opening a sewage treatment plant that will release treated water into Onondaga Lake. The Onondaga Yacht club members sail yachts in this lake. The Yacht club is trying to decide on the membership fee they should charge this year. The Onondaga Yacht club can charge nothing, have no members and make no profit, set a fee of $100 per person and have the profits listed in the table, or a $200 per person fee and have the profit listed in the table. The payoffs to Syracuse are cost reductions from the current level for sewage treatment. Syracuse can choose no plant, a small plant, or a large plant.

		Onondaga Yacht Club					
		No fee		$100 fee		$200 fee	
Syracuse sewage treatment	No plant	0	0	0	14,000	0	15,000
	Small plant	10,000	0	10,000	10,000	10,000	5,000
	Large plant	15,000	0	15,000	2,000	15,000	-3,000

a) Describe the full set of best response strategies and the Nash Equilibrium outcome of this game.

A court has passed a judgment that Onondaga Yacht club must be compensated by Syracuse by $7,000 if the small plant is built and $14,000 if the large plant is built. The following payoffs result.

		Onondaga Yacht Club					
		No fee		$100 fee		$200 fee	
Syracuse sewage treatment	No plant	0	0	0	14,000	0	15,000
	Small plant	3,000	7,000	3,000	17,000	3,000	12,000
	Large plant	1,000	14,000	1,000	16,000	1,000	11,000

b) Describe the full set of best response strategies and the Nash Equilibrium outcome of this game.

c) Contrast these outcomes in terms of the sum of the payoffs to the two players and the concept of Pareto improvement.

11) The inverse demand curve is given as p=80-2*q. The inverse supply curve is given as p=5+q.

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

       b. What is the price-quantity equilibrium pair if the market is supplied by a monopolist?

       c. Draw these two outcomes on a single graph.

       d. Calculate the following areas:

	Consumer Surplus	Producer Surplus	Total Social Welfare
Perfect Competition			
Monopoly			

12) Circle the correct answer.

Statement	The statement is (circle the correct answer)
Real values are expressed in inflation adjusted units.	True False
Producer surplus is calculated as the area below the demand curve and above the price line.	True False
Bundles that lie on the expansion path are economically efficient	True False
Increasing the discount rate increases the present value of future benefits.	True False
The internal rate of return is the value of r at which present value benefits equal present value costs for a project.	True False
Economic efficiency is achieved when a market arrives at a Pareto optimal outcome.	True False
The cross price elasticity for a substitute is a negative number.	True False
The income elasticity for a normal good is a negative number.	True False

13) The demand curve is given to you as q=450-50*p.
   a. Fill out the following table (use the relatively higher price / relatively lower quantity pair for the denominator in the elasticity calculation)

Price	Quantity	Elasticity
1		-----------------------
2		
3		
4		
5		
6		

   b. Draw this demand curve with price on the y-axis and quantity on the x – axis. Identify the range over which this curve is elastic or inelastic.

14) 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	10	10	-------	------	-----	------	---------
1	10	25	15	15	10	25	15
2	10	39	29	14.5	5	19.5	14
3	10	54	44	14.67	3.33	18	15
4	10	72	62	15.5	2.5	18	18
5	10	94	84	16.8	2	18.8	22

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

c. If market price for the output produced is 15, what level of output is profit maximizing for a firm if the market structure is perfectly competitive?

15) 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.

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

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

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

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

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

Work Page