Short questions

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Comprehensive Review due Jul 31, 2024 07:30 CST Completed
Question on Transcripts

2/2 points (graded)

Did you use the Spanish transcripts when taking this course?

- Yes ✔
- No ✔

If you used the Spanish transcripts when taking this course, did you find them helpful?

- Yes, they were helpful. ✔
- No, they were not helpful. ✔
- I did not use the Spanish transcripts. ✔

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Problem E3.1.1

1/1 point (graded)

Roman sees Californian red wine and cheese, both normal goods, as perfect complements. He consumes positive quantities of both. Then a bad year in the Napa Valley raises the price of Californian wine by 20%.

All else equal, Roman's consumption of cheese...

- ...increases
- ...remains the same
- ...decreases ✔
- The answer cannot be determined

✔

Explanation
Roman's utility function is $U(W, C) = \min\{W, C\}$. With perfect complements there is no substitution effect, but the higher price of wine results in a negative income effect. Roman will decrease both his consumption of both goods.

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Problem E3.1.2

1/1 point (graded)

Josh spends all of his money on instant ramen, an inferior good, and soda. He consumes positive quantities of both, and no other goods are available to him. A ban of trade with Mexico increases the price of soda by 20%, and does not affect the price of ramen. Josh's consumption of soda...

- ...increases
- ...remains the same
- ...decreases ✔
- The answer cannot be determined

✔

Explanation
Since instant ramen are an inferior good, soda must be a normal good. Therefore the income and substitution effect go in the same direction; Josh's consumption of soda will decrease.

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Problem E3.1.3

1/1 point (graded)

You are asked to determine whether a group of private schools are behaving like a cartel. Demand for private schools is given by $Q = 3000 - P$, and schools are charging a price of $P = 1000$. There are no taxes or subsidies. Given this, it is clear that schools are...

- ...behaving like a cartel
- ...not behaving like a cartel ✔
- The answer cannot be determined

✔

Explanation
The demand curve has a slope of -1, so the price elasticity of demand is exactly -1 when the price equals the quantity demanded. At higher prices, demand is more elastic. At lower prices, demand is less elastic.
For a monopolist (or cartel), marginal revenue is positive when the demand curve is elastic, so marginal revenue will always meet marginal cost in the elastic part of the demand curve.
Since the price 1000 is less than 1500, then we know that the price is in the inelastic part of the demand curve.
We know that monopolists never charge a price in this section so we can conclude that they are not forming a cartel.

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Public healthcare insurance

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Problem E3.2.1

2/2 points (graded)

The government wants to make sure all workers have healthcare so they are considering instituting a program where they tax firms $10 per worker to fund healthcare facilities for employees. Suppose the market demand curve for labor is given by $D(p) = 100 - p$ and the market supply curve of labor is given by $S(p) = p + H - 10$ where p is the price of labor, and H is how much the workers value the health services when they are provided by the tax.

Find the equilibrium quantity and price without the tax and without the healthcare ($H = 0$).

$p^* =$

55 ✔ Answer: 55

55

$Q^* =$

45 ✔ Answer: 45

45

Explanation

$$100 - p^* = p^* - 10$$
$$110 = 2p^*$$
$$55 = p^*$$
$$Q^* = 45$$

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Problem E3.2.2

2/2 points (graded)

Find the equilibrium with the $10 per worker tax and assuming the workers don't value the healthcare at all ($H = 0$).

$p^* =$

50 ✔ Answer: 50

50

$Q^* =$

40 ✔ Answer: 40

40

Explanation

$$90 - p^* = p^* + 0 - 10$$
$$100 = 2p^*$$
$$50 = p^*$$
$$Q^* = 40$$

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Problem E3.2.3

2/2 points (graded)

Now suppose that in addition to the tax, the potential employees value the provided healthcare at $10 ($H = 10$). Find the new equilibrium. Consider intuitively whether and how the workers valuing the healthcare changes the deadweight loss created by the tax alone.

$p^* =$

45 ✔ Answer: 45

45

$Q^* =$

45 ✔ Answer: 45

45

Explanation

$$90 - p^* = p^* + 10 - 10$$
$$90 = 2p^*$$
$$45 = p^*$$
$$Q^* = 45$$

The worker's valuing of the healthcare eliminates the deadweight loss created by the tax because they value the good at exactly the level of the tax so the wage simply decreases by that amount ($10) and quantity remains at the competitive level of 45.

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Leontief cocoa

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Problem E3.3.1

1/1 point (graded)

You sell homemade hot chocolate, which only needs two ingredients: milk and cocoa powder. The production function is given by $h(m,c) = (\min\{m,c\})^{\frac{1}{2}}$,where m represents cups of milk, c represents tablespoons of cocoa powder and h represents cups of hot chocolate. One cup of milk costs 40 cents and one tablespoon of cocoa powder costs 10 cents. It is a perfectly competitive market with each cup of hot chocolate sold at $4. Solve for the optimal cups of hot chocolate that you should make to maximize profit.

$q^* =$

4 ✔ Answer: 4

4

Explanation
Since milk and cocoa powder are perfect complements, you will always produce at $m = c$ because if $m > c$ (or $m < c$) you could lower the cost and produce the same amount of hot chocolate by lowering m (or c). So $h = (\min\{m,c\})^{\frac{1}{2}} = (\min\{m,m\})^{\frac{1}{2}} = m^{\frac{1}{2}}$, $m^* = c^* = h^2$. Total cost is $TC = .4m + .1c = .4h^2 + .1h^2 = .5h^2$. So $MC = h$. To maximize profit, you produce at $MC = p = 4$, so you produce 4 cups of hot chocolate.

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Battle of the sexes

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Problem E3.4.1

2/2 points (graded)

Alice and Bob are deciding whether to go to the opera or the park but cannot communicate with each other. Alice prefers the park over the opera, receiving a payoff of 2 for the park and a payoff of 1 for the opera. Bob is the opposite, he would get a payoff of 2 for going to the opera and 1 from the park. But they would like to go to the same place, so Alice and Bob each get 2 additional units of utility if they end up in the same place.

Represent their moves as (Alice,Bob).

What are the (pure strategy) Nash Equilibria of this game?
(Select each correct answer.)

- [x] (Opera,Opera)
- [ ] (Park,Opera)
- [ ] (Opera,Park)
- [x] (Park,Park)
- [ ] None of the above

Explanation
There are 2 Nash Equilibria, (Opera,Opera) and (Park,Park).

What are the dominant strategies?
(Select each correct answer.)

- [ ] (Opera,Opera)
- [ ] (Park,Opera)
- [ ] (Opera,Park)
- [ ] (Park,Park)
- [x] None of the above

Explanation
No strategy dominates any other.

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Previous Next

The value of innovation

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Problem E3.5.1

3/3 points (graded)

Apple is deciding whether or not to invest $10,000 in research and development to develop the iGlasses. If they make this investment today, they will be able to develop the iGlasses for sure and start selling them starting from next year. They will also obtain a 10 year patent on the product. Once the patent expires, copycats will leap into the market and make it perfectly competitive. Other than the research and development investment, the cost of producing iGlasses is approximately 0. Suppose that market demand for the iGlasses is $p = 200 - 5q$ in each year. The interest rate is 10% and there is no inflation.

Apple will...

- (•) ...develop the iGlasses
- ( ) ...not develop the iGlasses
- ( ) The answer is ambiguous.

✔

Explanation
If Apple develops the iGlasses they will make monopoly profits every year in which they are protected by the patent and 0 once the patent expires. The monopoly price is $p^M = 100$, the monopoly quantity is $q^M = 20$ and monopoly profits are $\pi^M = 2000$ per year. The NPV of this investment is:

$$NPV = -10000 + \sum_{t=1}^{10} \frac{2000}{(1.1)^t} \approx 2289$$

Since the NPV is positive, Apple would invent the iGlasses.

Suppose that the U.S. government decreases the number of years for which a patent is valid to 5.

Apple will...

- ( ) ...develop the iGlasses
- (•) ...not develop the iGlasses
- ( ) The answer is ambiguous.

✔

Explanation
If the patent only lasts 5 years, the NPV of this investment is:

$$NPV = -10000 + \sum_{t=1}^{5} \frac{2000}{(1.1)^t} \approx -2418$$

Since the NPV is negative, Apple would not invent the iGlasses.

Following this example, how we can expect the length of patents to affect innovation?

- ( ) Shorter patents will most likely increase innovation
- (•) Shorter patents will most likely decrease innovation

✔

Explanation
If patents are not valid for a long enough time, incentives to innovate may be reduced.

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Specializing in beer

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Problem E3.6.1

2/2 points (graded)

In the US, beer and meat are the only two commodities produced and consumed. A gallon of beer requires 5 minutes of labor to produce, and a pound of meat requires 8 minutes of labor to produce. Assume that labor is the only input needed to produce beer and meat. There is a total of 123 billion hours of labor per year, and a total of 6.3 billion gallons of beer and 48 billion pounds of meat are produced each year in the US. Assume that wage is the same in the production of both goods, and the markets for the goods are both perfectly competitive.

Within the US under autarky, what is the ratio of the price of meat to the price of beer?

1.6 ✔ Answer: 1.6

1.6

Explanation
The marginal cost of beer is 5 minutes of labor, and the marginal cost of meat is 8 minutes of labor, so the market price of meat is 1.6 times the market price of beer.

Let the ratio above be $\bar{k}$. Suppose that on the international market, we can trade any amount of beer for meat or meat for beer, at a ratio of k gallons of beer to 1 pound of meat.

For what values of k will international trade increase the welfare in the US relative to autarky?
(Select each correct answer.)

- [x] $k < \bar{k}$
- [ ] $k = \bar{k}$
- [x] $k > \bar{k}$
- [ ] None of the above

✔

Explanation
At any k except 1.6, the welfare in the US will be higher, as it can specialize in one good and beneficially trade for the other.
At $k = 1.6$, welfare in the US will be unchanged whether it specializes in beer, or specializes in meat, or diversifies.

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The leaky bucket

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Problem E3.7.1

4/4 points (graded)

Consider a society of 100 inhabitants composed by two types of individuals. Half of them are poor and have a yearly income of 10,000 dollars, and half of them are rich, with an annual income of 90,000 dollars. The government plans to tax annual income at a flat rate in order to redistribute it with a lump sum transfer T per person that is equal for all members of the society. However, for a positive tax rate of τ over annual income, there is a τ^2 leak in the bucket. Thus, for each dollar of income taxed, the total tax revenue collected is equal to $\tau - \tau^2$. Assume $\tau \geq 0$.

Solve in terms of τ and T, the total income that a poor individual has after taxes are collected and transfers are made.

Solve in terms of τ and T, the total income that a rich individual has after taxes are collected and transfers are made.

Assuming that the government needs to balance the budget, solve the budget constraint of the government, and solve for the lump sum transfer T in terms of τ.

To show demonstrate that you have solved these constraints, assume for a moment that $\tau = 0.2$. Given that the government needs to balance the budget, what would be T?

$T =$

8000 ✔ Answer: 8000

8000

Again assuming that $\tau = 0.2$, what would be the total income of a poor individual?

$y_{\text{poor}} =$

16000 ✔ Answer: 16000

16000

Again assuming that $\tau = 0.2$, what would be the total income of a rich individual?

$y_{\text{rich}} =$

80000 ✔ Answer: 80000

80000

Explanation
The total income of a poor individual in this case is given by $10000\,(1-\tau) + T$.
The total income of a rich individual in this case is given by $90000\,(1-\tau) + T$.
We know that the budget constraint of the government must satisfy that tax revenues equal transfers. Thus, we should have that

$$100T = 50 \cdot 10000\tau\,(1-\tau) + 50 \cdot 90000\tau\,(1-\tau)$$

$$T = 0.5 \cdot 10000\tau\,(1-\tau) + 0.5 \cdot 90000\tau\,(1-\tau)$$

$$T = \tau\,(1-\tau)\,(50000)$$

Now, what is the *optimal* tax rate τ_{poor} that maximizes the income of a poor individual?

$\tau_{\text{poor}} =$

0.4 ✔ Answer: 0.4

0.4

Explanation
We have that the total income of a poor individual is given by

$$10000\,(1-\tau) + 50000\tau\,(1-\tau) = 10000 + 40000\tau - 50000\tau^2$$

If we maximize this with respect to τ we have that the first order condition of this problem is given by

$$40000 = 100000\tau^*_{\text{poor}}$$

$$\tau^*_{\text{poor}} = 0.4$$

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Problem E3.7.2

1/1 point (graded)

Using what you found above, what is the optimal tax rate τ_{rich} that maximizes the income of a rich individual?

$\tau_{\text{rich}} =$

0 ✔ Answer: 0

0

Explanation
We have that the total income of a rich individual is given by

$$90000\,(1-\tau) + 50000\tau\,(1-\tau) = 90000 - 40000\tau - 50000\tau^2$$

If we maximize this with respect to τ we have that this problem has a corner solution and the optimal tax rate for the rich τ^*_{rich} is equal to zero.

$$-40000 - 100000\tau^*_{\text{rich}} < 0$$

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Problem E3.7.3

1/1 point (graded)

How do the solutions by the poor and the rich illustrate the trade-off between equity and efficiency?
(Select each correct answer.)

- [x] The optimal tax rate from the perspective of the rich yields higher efficiency
- [ ] The optimal tax rate from the perspective of the rich yields higher equity
- [ ] The optimal tax rate from the perspective of the poor yields higher efficiency
- [x] The optimal tax rate from the perspective of the poor yields higher equity
- [x] Efficiency is lost due to the leaky bucket
- [ ] Efficiency is lost due to diminishing marginal utility
- [ ] This redistribution is perfectly efficient

✔

Explanation
Notice that if we use the optimal tax rate from the point of view of a rich individual, we end up in the same initial situation: a rich person has an annual income of 90,000 and a poor person an annual income of 10,000. The total income in the society is equal to

$$50 \cdot 90000 + 50 \cdot 10000 = 4500000 + 500000 = 5000000$$

On the other hand, the tax rate that maximizes the income of the poor reduces inequality since with this tax rate, the level of income of the poor is equal to 18,000, and for the rich is 66,000. The total income in this society would be given by:

$$50 \cdot 18000 + 50 \cdot 66000 = 900000 + 3300000 = 4200000 < 5000000$$

Thus, due to the costs associated with tax collection and for redistributive purposes, 800,000 were lost. Diminishing marginal utility cannot be assumed from the problem, and if it existed and were taken into consideration for the purposes of efficiency, it would only increase efficiency.

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Waiting at the benefits office

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Problem E3.8.1

3/3 points (graded)

Suppose poor households have preferences over consumption (C) and leisure (T) given by $u(C,T) = \ln(C) + \ln(T)$, and they can work at hourly wage $w_p = 5$. Assume consumption costs one dollar, and they have 24 hours in a day to allocate to either leisure or working.

Solve for the household's optimal bundle of consumption and leisure.

$C =$

60 ✔ Answer: 60

60

$T =$

12 ✔ Answer: 12

12

How much utility do they get?

$u =$

6.5793 ✔ Answer: 1*ln(720)

6.5793

Explanation
From MRS=MRT,

$$MU_C = \frac{1}{C}$$

$$MU_T = \frac{1}{T}$$

$$\frac{MU_T}{MU_C} = \frac{T^{-1}}{C^{-1}} = w_p$$

$$\frac{C}{T} = w_p.$$

From the (time) budget constraint,

$$T + \frac{C}{w_p} = 24.$$

Combining,

$$C = 12w_p$$

$$T = 12$$

Thus they consume $C = 60$ and get utility $u = \ln(60) + \ln(12) \approx 6.5793$.

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Problem E3.8.2

3/3 points (graded)

To help the poor, the government offers an income transfer of $20, but because picking up the check takes time, participants can only work up to 5 hours per day if they sign up for the program. (Continue to assume any time not spent working is leisure.)

Find their optimal bundle when the program is in effect.

$C =$

45 ✔ Answer: 45

45

$T =$

19 ✔ Answer: 19

19

How much utility do they get?

$u =$

6.7511 ✔ Answer: 1*ln(855)

6.7511

Explanation
With no restrictions on time the poor would choose

$$C = \frac{24w_p + 20}{2} = 70.$$

$$T = \frac{24w_p + 20}{2w_p} = 14.$$

But that violates the terms of the program, so instead they get as close to this allocation as they can and choose

$$C + 19w_p = 24w_p + 20$$

$$C = 5w_p + 20 = 45$$

$$T = 19.$$

Thus they get utility $u = \ln(45) + \ln(19) \approx 6.75110$.

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Problem E3.8.3

3/3 points (graded)

If the poor have a choice to sign up for the program, will they?

- (•) The poor will choose to enroll
- ( ) The poor will not choose to enroll
- ( ) The poor are indifferent about enrolling

✔

What if the program didn't limit their labor supply, and was a pure income transfer of $20?

- (•) The poor would choose to enroll
- ( ) The poor would not choose to enroll
- ( ) The poor would be indifferent about enrolling

✔

It's possible that the answers above depended on the functional form of the utility function. Suppose that the utility function of the poor was $u(C,T) = C$, and that the program limits labor supply.

In this case, if the poor had a choice to sign up for the program, would they?

- ( ) The poor would choose to enroll
- (•) The poor would not choose to enroll
- ( ) The poor would be indifferent about enrolling

✔

Explanation
Without either program the poor get utility 6.5793. In deciding whether to sign up, they must weigh the tradeoffs between decreased consumption but increased leisure. Enrolling gives them utility 6.7511 so they will choose to enroll in the program.
If there were no labor restrictions, the poor would still sign up because they could then implement their optimal bundle of $C = 70$ and $T = 14$ which gives them higher utility.
The poor will not always sign up for the program if there are work restrictions. If, for example, the utility function of the poor was $u(C,T) = C$, the poor would not sign up for the program since the program reduces consumption. If there were no work restrictions, however, the poor will always sign up because the program gives them free money.

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Previous Next