

ECON 0100
Fall 2022
Final
December 15, 2022
Time Limit: 120 Minutes

Name (Print): _____

Penn ID number: _____
(8 digits)

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- This exam contains 9 pages (including this cover page) and 16 questions. Check to see if any pages are missing.
 - The exam is scheduled for 2 hours.
 - The total score is 40 points.
 - This is a closed-book, closed-note, no calculator exam.
 - Answer each multiple-choice question by filling in the bubble for the answer you select. Make sure that the bubble is clearly filled in, or it will be marked incorrect.
 - Write your answers to the short answer questions in the spaces provided for them. Do not write your answers outside of the boxes.
 - Do not remove any pages or add any pages. No additional paper is supplied
 - Show your work when asked. Label all graphs carefully.
 - This exam is given under the rules of Penn's Honor system.

My signature certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination.

Please sign here _____ Date _____

Multiple Choice Questions (best 12 out of 13: 18 points total)

1. (1.5 points) Fernanda has already registered for 4 Spring classes, and is considering adding calculus as a 5th class. She is very interested in the debate club, which meets at the same time as the calculus class. She values the debate club at \$50 per semester, and membership costs \$5. Taking the calculus class would yield Fernanda \$100 worth of benefit, while it would cost her no extra tuition. She also has the option of taking only 4 classes and not joining the debate club, which would free up some of her time to be an Econ tutor. The tutoring job is paid \$160 per semester and has no cost. What is Fernanda's opportunity cost of taking the calculus class?
- 45
 - 100
 - 160**
 - 205
 - none of the above
2. (1.5 points) Consider the perfectly competitive market for chocolates, with a downward sloping linear demand and upward sloping linear supply. Suppose at the initial equilibrium, demand is inelastic. If the price of sugar (an input in chocolate production) increases, which of the following *could* be true?
- I. At the new equilibrium, demand is inelastic.
 - II. At the new equilibrium, demand is elastic.
 - III. At the new equilibrium, demand is unit-elastic.
- I. only
 - II. only
 - III. only
 - I. and II.
 - I. and III.
 - II. and III.
 - I., II. and III.**
 - None
3. (1.5 points) Consider a market for chairs. The market is perfectly competitive and in **long-run** equilibrium. Each firm currently produces 10 chairs and the market demand is given by $Q_d = 6000 - 100P$. If there are 100 identical firms in the market, what is each firm's total cost of producing 10 chairs?
- \$100
 - \$300
 - \$500**
 - \$600
 - \$1000
 - Not enough information to determine

4. (1.5 points) Suppose the market for milk is characterized by a downward sloping demand curve, $P = 10 - Q_D$ and upward sloping supply curve, $P = 2 + Q_S$. Suppose that the government imposes a price ceiling of \$5. Which of the following statements are true?
- I. Before the price ceiling was introduced, in equilibrium, $Q = 4$ and $P = 6$.
 - II. The deadweight loss from the price ceiling is equal to 2.
- I. only**
- II. only
- I. and II.
- Neither I. nor II.
5. (1.5 points) Consider a perfectly competitive market for electric vehicles. The daily demand and supply for electric vehicles are given by $P = 50,000 - Q_d$ and $P = 10,000 + Q_s$, respectively. Suppose the government decides to grant consumers a subsidy of 5,000 per electric vehicle purchased. What is true about the incidence of the subsidy?
- Consumers benefit more than producers
 - Producers benefit more than consumers
 - Consumers and producers benefit equally**
 - Not enough information to determine
6. (1.5 points) The island of Tuntiki produces coffee beans and 3D printers. In one day, it can produce either 12 pounds of coffee, or 36 printers. The island population views the two goods as perfect complements in consumption, at a rate of 1 for 1. On the world market, each pound of coffee can be traded for 1 printer. Which of the following is true?
- I. Without trade, Tuntiki produces 12 printers and 8 pounds of coffee.
 - II. Tuntiki would not produce any coffee if it could trade at the world price.
- I. only
- II. only**
- Both I. and II.
- Neither I. nor II.
7. (1.5 points) The city of Philadelphia currently provides the efficient quantity of street lights which is a public good. Suppose there are only two residents Anthony and Bob. Anthony's marginal benefit for street lights is $MB_A = 10 - q$ and Bob's marginal benefit is $MB_B = 2 - q$. The marginal cost of providing street lights is $MC = q$. If Bob were to leave Philadelphia, by how much would the efficient quantity change?
- No change in the efficient quantity**
- The efficient quantity increases by 1 street light
- The efficient quantity decreases by 1 street light
- The efficient quantity is now 0 street lights

8. (1.5 points) Assume the market for railway service in the Northeast United States is a natural monopoly, with associated costs of $ATC = 25/Q + 5$, $MC = 5$, where Q is measured in thousands of passengers. Assume there is a demand curve of $P = 15 - Q$.

Which of the following statements is true?

- In the absence of government intervention, the monopoly would charge $P = \$5$ and produce $Q = 10$.
- Following an average cost pricing would have $P = \$10$ and $Q = 5$.**
- Using a marginal cost pricing rule would require a lump sum subsidy of \$5 to cover for the firm's losses.
- Average cost pricing rule leads to no dead weight loss.

9. (1.5 points) Consider the market for corn production, which causes a negative externality (fertilizer runoff). Compare a market where all farms are owned by Big Farm Corp (monopoly) to a market filled with small family-owned farms (perfect competition). Assume all other factors are equal in the two markets (marginal costs, demand, etc).

Which of the following statements *must be true*?

- The deadweight loss will be higher with perfect competition than with Big Farm Corp.
- The quantity produced by Big Farm Corp is less than the socially efficient quantity.
- The government can tax Big Farm Corp to reach the socially efficient quantity.
- None of the above.**

10. (1.5 points) Consider the following penalty kick game, where Harry (the kicker) must choose between kicking left (L) or right (R), while Hugo (the goalie) must choose between diving left (L) or right (R). In each cell, payoffs are Harry's and Hugo's, respectively.

		Hugo	
		<i>L</i>	<i>R</i>
Harry	<i>L</i>	0, 1	2, 1
	<i>R</i>	3, 2	2, 3

Which of the following is true?

- I. There is a Nash Equilibrium that is Pareto efficient.
 - II. The game is an example of a prisoner's dilemma.
- I. only**
 - II. only
 - Both I. and II.
 - Neither I. nor II.

11. (1.5 points) Consider the market for Halal food trucks as being monopolistically competitive. Assume costs of $TC = 9 + q + q^2$, $MC = 2q + 1$, and demand $P = 13 - q$, where q is measured in hundred of gyros. Which of the following statements must be true *in the long run*?

- I. There will be more Halal trucks

II. Profits will increase

- I. only
- II. only
- I. and II.
- Neither I. nor II.

12. (1.5 points) Alice and Bob, students at Penn, are working at United by Blue on campus and making \$15/hour. They are both currently working 15h/week. When they are not at their jobs, they are studying at Van Pelt, so their choice is between working and studying. The City of Philadelphia decides to raise its minimum wage to \$20/hour, and Bob decides to only work 10h/week, whereas Alice decides to work 20h/week. Consider which of the following statements *must* be true:

- I. For Bob, studying is a normal good.
 - II. For Alice, studying is an inferior good.
 - III. For Bob, the income effect dominates the substitution effect on studying.
- I. only
 - II. only
 - III. only
 - I. and II.
 - I. and III.
 - II. and III.
 - I., II. and III.
 - None

13. (1.5 points) It is the year 2030 and Amazon is now a profit maximizing monopsony in the market for delivery workers in the US. In response to workers' pressure, the government has decided to set the minimum wage in this market at the competitive rate, starting next quarter. Assuming there is no other change in the market, what will be the effect of this policy?

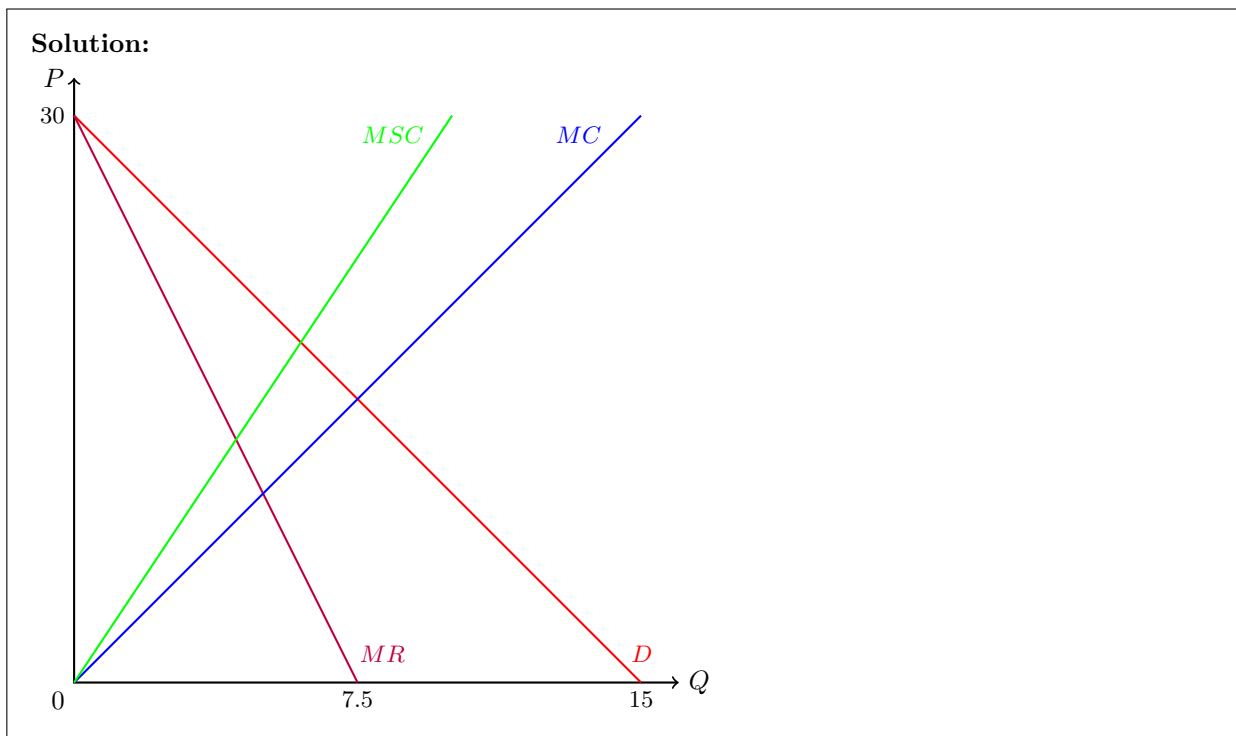
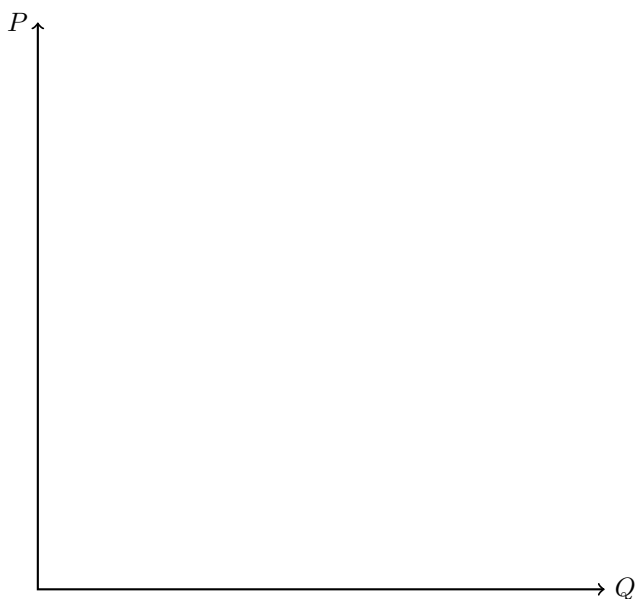
- Nothing will change, since Amazon is already offering the competitive wage.
- Employed workers will receive a higher wage, but unemployment will increase since now Amazon will not want to hire as many workers.
- Employed workers will receive a higher wage, and employment will increase, since now more workers want to work at Amazon.**
- None of the above.

Short Answer Questions (22 points total)

To get any point you must show your work

14. In the market for ride shares in the city of Chicago, Uber is a single-price monopolist. Suppose Uber faces inverse demand curve $P = 30 - 2Q_D$ and marginal cost $MC = 2Q$, where P is in U.S. dollars and the Q is in millions of weekly Uber trips.

- (a) Draw the market demand, marginal cost and marginal revenue curves on the graph. Label each of the three curves and all intercepts (the graph doesn't have to be to scale).



- (b) Suppose the monopolist maximizes its profit. The quantity and price chosen by Uber are $Q_M =$ 5 and $P_M =$ 20.

Solution: The MR equation is $MR = 30 - 4Q$. To maximize its profit, Uber chooses the quantity that equates marginal revenue and marginal cost: $MR = MC \Rightarrow 30 - 4Q = 2Q \Rightarrow 6Q = 30 \Rightarrow Q = 5$. Then, to find the price that Uber chooses, it suffices to plug in the quantity chosen into the demand equation: $P = 30 - 10 = 20$

A new study by academic economists claims that Uber has a non-negligible effect on traffic congestion and local pollution. They calculate that overall, Uber rides generate a production externality such that the marginal social cost is $MSC = 3Q$.

- (c) Are the economists claiming that Uber generates a positive or a negative production externality? Explain in the box below.

Solution: Negative externality because $MSC > MPC$

- (d) Draw the social marginal cost curve in the same graph as part (a). Label the social marginal cost curve and its x and y-intercepts.

- (e) The socially efficient quantity is $Q_E = \underline{\quad 6 \quad}$

Solution: To find the socially efficient quantity, it suffices to equate the social marginal cost and demand functions: $3Q = 30 - 2Q \Rightarrow 30 = 5Q \Rightarrow Q_E = 6$.

- (f) In order to achieve social efficiency, the city of Chicago only has two possible policy levers: a per-unit tax or per-unit subsidy on Uber rides. What should the government do? If a per-unit tax or subsidy is necessary to achieve efficiency, how much should it be? Explain in the box below.

Solution: The efficient quantity is higher than the monopoly quantity, so the government should use a per-unit subsidy. To find the Pigouvian subsidy s , we need to find s such that the profit maximizing monopolist produces Q_E , i.e. $MR = MC - s$ at Q_E : $30 - 4Q_E = 2Q_E - s$, where $Q_E = 6$. Hence, we need to solve for s in $30 - 24 = 12 - s \Rightarrow s = 6$.

15. The Schuylkill river has a reputation of being dirty and polluted, which is a concern for local residents. City hall is considering a plan to have it regularly treated. Suppose there are 200 residents living near the river: 100 residents live on the left bank ("L") and each has an individual marginal benefit $MB^L = 6 - 2q$ from treating the river, while 100 residents live on the right bank ("R"), and each has an individual marginal benefit $MB^R = 4 - q$ from treating the river, where q is the number of treatments. The cost of each treatment is 700.

- (a) What is the marginal social benefit (MSB) equation from treating the river? Show your work in the box below.

Solution: $MSB = 1,000 - 300q$ if $q \leq 3$ and $MSB = 400 - 100q$ if $3 \leq q \leq 4$.

- (b) The socially efficient number of treatments is $q_E = \underline{\quad 1 \quad}$

- (c) Suppose the city government wants to charge the same fee to each resident to finance the socially efficient quantity q_E . How much should each resident pay? Will all residents accept this payment scheme? Explain in the box below.

Solution:

- Each left-bank resident's *total* benefit is $TB_L = \underline{\quad \mathbf{5} \quad}$
- Each right-bank resident's *total* benefit is $TB_R = \underline{\quad \mathbf{3.5} \quad}$

The total cost of the socially efficient quantity is 700. There are 200 residents, so each resident would have to pay 3.5, which is below TB_L and equal to TB_R so all residents would accept this scheme.

16. In the kingdom of Numenor, blacksmiths are hired to produce swords. Suppose the market for swords is perfectly competitive.

- (a) Suppose the labor market for blacksmiths is perfectly competitive. Labor demand is $w = 100 - L_D$ and labor supply is $w = 10 + L_S$, where L is the number of blacksmiths and w is in gold coins.

The equilibrium level of employment is $L^* = \underline{\quad \mathbf{45} \quad}$ and the equilibrium wage is $w^* = \underline{\quad \mathbf{55} \quad}$.

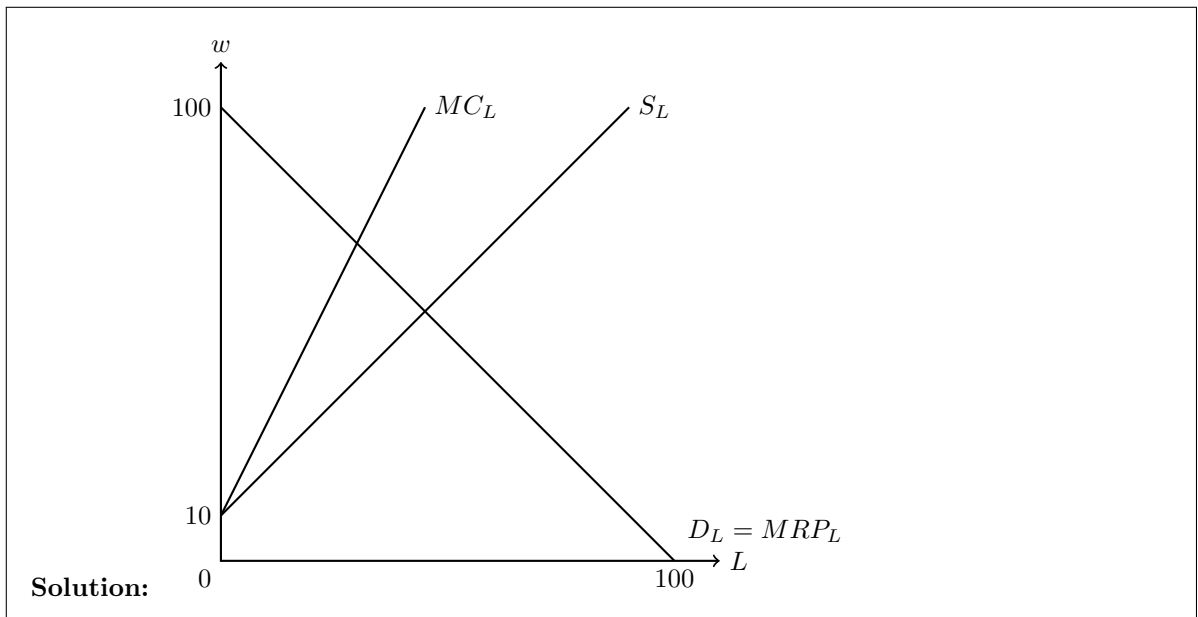
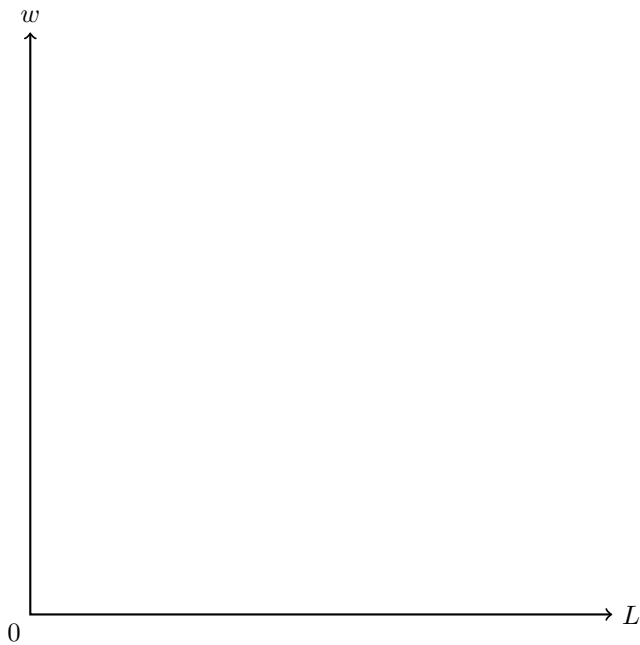
- (b) Dissatisfied with their wage, blacksmiths decide to organize into a guild. They declare that no blacksmith may be employed for less than $w_{min} = 50$ gold coins.

With the guild-imposed minimum-wage, the level of employment is $L' = \underline{\quad \mathbf{45} \quad}$ blacksmiths.

- (c) The Queen-Regent of Numenor decides to disband the guild and to force all blacksmiths to work in her castle, thus becoming a monopsonist in the labor market, facing labor supply $w = 10 + L_S$. Suppose each blacksmith's marginal product is $MP_L = 100 - L$ and the equilibrium price in the perfectly competitive market for swords is $P^* = 1$.

i. The equation of the marginal revenue product of labor is $MRP_L = \underline{\quad 100 - L \quad}$.

ii. In the graph below, draw the marginal revenue product of labor MRP_L , labor supply S_L and marginal cost of labor MC_L . Label all curves and intercepts.



iii. The monopsony level of employment is $L_M = \underline{\quad 30 \quad}$ and the monopsony wage is $w_M = \underline{\quad 40 \quad}$.

(d) The kingdom of Numenor is at war. Hoping to hire more blacksmiths, the Queen-Regent of Numenor decides to restore the minimum wage $w_{min} = 50$.

As a result, the level of employment is $L'_M = \underline{\quad 40 \quad}$ blacksmiths.