ECON 0100
Spring 2023
Final Exam
May 5, 2023
Time Limit: 120 Minutes

Name (Print): _____

Penn ID number: _____
(8 digits)

- This exam contains 11 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) Javi had just purchased a $100 non-refundable ticket to see Tini Live in NYC on May 4th, when she received an email announcing her ECON final exam would take place the next day, May 5th. Javi knows that she will have a bad grade on the exam if she attends the concert, while staying in Philadelphia to study guarantees a good grade. She values having a good grade at $200, and attending the concert at $400. The round-trip bus ticket to NYC costs $50, and she is planning to spend $50 on merch if she goes to the concert. Which of the following is correct?

   I. Javi should stay in Philadelphia to study

   II. The opportunity cost of the concert is $300

   III. The opportunity cost of staying in Philadelphia to study is $300

   ◯ I. and II.

   ◯ I. and III.

   √ **II. and III.**

   ◯ II. only

   ◯ III. only

2. (1.5 points) Bob and Charlie both consume apples and oranges and have typical downward sloping convex indifference curves. Bob's income is $20 while Charlie's income is $15. Suppose the price of apples doubles. Which of the following statements must be true?

   I. At their initial consumption bundles, Bob and Charlie have the same marginal rate of substitution between apples and oranges.

   II. At their new consumption bundles, Bob consumes more apples than Charlie.

   √ **I. only**

   ◯ II. only

   ◯ I. and II.

   ◯ Neither I. nor II.

3. (1.5 points) Jake, an Eagles fan, is attending the Superbowl. In the Eagles stadium in Philly, vendors charge $4 for a hot dog and $2 for a beer, and Jake usually buys 3 hot dogs and 3 beers. When he gets to Glendale, AZ for the Superbowl, beer costs the same as in Philly but the price of a hot dog is $5. As a result, he decides to buy 2 hot dogs and 4 beers. Which of the following is true?

   ◯ Beers and hot dogs are complements for Jake

   ◯ Jake's demand for hot dogs is inelastic in that price range

   √ **Hot dogs can be an inferior good for Jake**

   ◯ All of the above

   ◯ None of the above

4. (1.5 points) After a night out last Saturday, Cung found himself in need of an Uber car at 2am. As he was requesting a ride, he noticed that rates were twice the usual level thanks to the company's surge pricing policy. What could explain the spike in price?

   ◯ Most bars in Philadelphia close around 2am.

   ◯ It was an unusually frigid night.

   ◯ Most Uber drivers had already gone home to bed.

   √ **All of the above.**

   ◯ None of the above.

5. (1.5 points) Suppose a perfectly competitive firm is producing at its profit-maximizing quantity and the following is true at its production point: P = 10, ATC = 15, AVC = 5. Which of the following is true?

   I. The firm will shut down in the short run because it is suffering losses.

   II. This firm may be making economic profits.

   ◯ Only I

   ◯ Only II

   ◯ Both I and II

   √ **Neither I nor II**

6. (1.5 points) Amy and Emily can produce two goods X and Y. While Amy can produce 3 units of X or 9 units of Y, Emily can produce 5 units of X or 8 units of Y. They decide to specialize and engage in trade with each other. Which exchange rate allows both of them to **strictly** benefit from trade?

   ◯ 1 X for 8/5 Y

   √ **1 X for 12/5 Y**

   ◯ 1 X for 3 Y

   ◯ 1 X for 5 Y

7. (1.5 points) Suppose Narnia is a small country with a domestic demand and supply for Turkish Delight given by $Q_D = 5,000–500P$ and $Q_S = 500P - 1,000$, respectively. Once Narnia enters the international market for Turkish Delight, we find that it is importing 2000 units of Turkish Delight. Given this fact, what must be the world price?

   ◯ $2

   ◯ $3

   √ **$4**

   ◯ $5

   ◯ $6

8. (1.5 points) The price elasticity of demand for coffee is $(-)0.9$. The price elasticity of demand for eggnog is $(-)1.4$ for most of the year, but during the holiday season it changes to $(-)0.5$. In both markets, supply starts from the origin. The government is considering a per-unit tax of $1 in one of these markets. Assuming no externalities, if the objective of the government is to minimize the deadweight loss resulting from the tax, it should tax:

   ◯ Coffee all year round

   √ **Coffee for most of the year but eggnog in the holiday season**

   ◯ Eggnog for most of the year but coffee in the holiday season

◯ Eggnog all year round

9. (1.5 points) Consider the housing market in West Philadelphia, where inverse demand is $P = 10,000 - Q_D$ and quantity supplied is fixed at $Q_S = 2000$. Penn State has found recruiting students to State College increasingly difficult, and thus has decided to open up a branch in West Philadelphia. The presence of Penn State students in West Philadelphia generates a marginal external cost on the neighborhood $MEC = Q$. The Philadelphia City Council wants to assure efficiency in West Philadelphia housing market. Which of the following policies *can* lead to the efficient level of output?

I. A per-unit tax on housing
II. A binding price floor on housing
III. Doing nothing

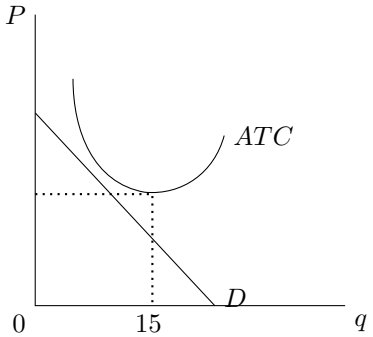
◯ I. only
◯ II. only
◯ III. only
◯ I. and II.
◯ II. and III.
√ **I. and III.**
◯ I., II and III.

10. (1.5 points) Consider a single price monopoly that faces a demand $P = 21 - 3Q$ and marginal cost $MC = Q$. Which of the following is true?

I. The quantity produced is 3
II. The price charged is 3
III. A price floor of 4 would be binding
IV. A price ceiling of 5 would be binding

◯ Only I
◯ I and II
◯ I, II and III
◯ I, II and IV
◯ I, II, III, IV
◯ I and III
√ **I and IV**

11. (1.5 points) Javi's food truck is operating in a monopolistically competitive market, facing the demand and average total cost curves described in the graph below.



Which of the following statements is true **in the long run**, assuming Javi stays in the market?

◯ Javi's ATC curve will shift in.

◯ Javi's demand curve will become flatter.

◯ Javi will be producing 15 units.

◯ All of the above.

√ **None of the above.**

12. (1.5 points) Consider the following 2-person static game where Leon is the row player, and Lucy is the column player. In each cell, Leon's payoff is written first. Which of the following is true?

		Lucy		
		L	C	R
Leon	T	$10, 10$	$-1, 9$	$-5, 8$
	M	$80, 6$	$0, 3$	$3, 5$
	B	$20, 2$	$13, 5$	$5, 4.5$

◯ Leon has a dominant strategy

◯ There is a unique Nash equilibrium

√ **There is a Pareto efficient Nash equilibrium**

◯ All of the above

13. (1.5 points) Jeremy is a worker at *Papa's Freezeria*, where he earns \$9.85 an hour and works 40 hours a week. Given a boom in business following great customer service, his boss gives him a raise to \$15 an hour. In response, Jeremy decides to work 45 hours a week. Let IE and SE be respectively the income effect and substitution efffect on leisure. Given this observation, which of the following *cannot* be true for Jeremy?

◯ Jeremy sees leisure as an inferior good and IE dominates SE

√ **Jeremy sees leisure as a normal good and IE dominates SE**

◯ Jeremy sees leisure as an inferior good and SE dominates IE

◯ Jeremy sees leisure as a normal good and SE dominates IE

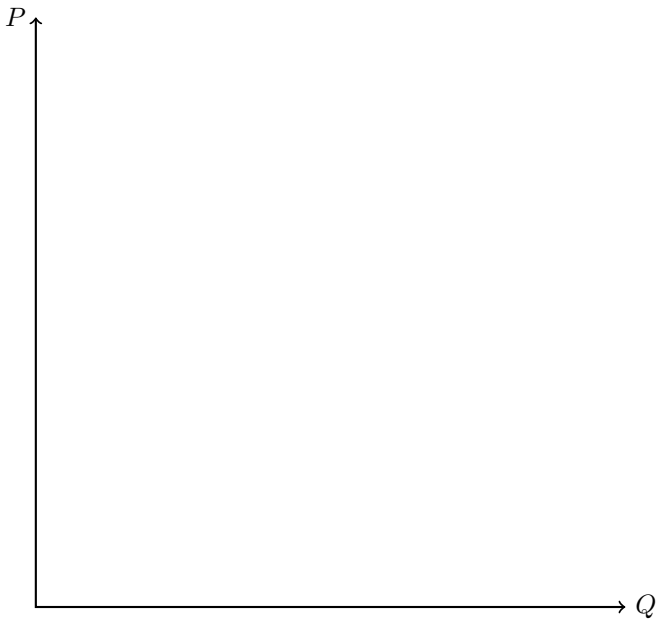
◯ All the above *could* be true

Short Answer Questions (22 points total)

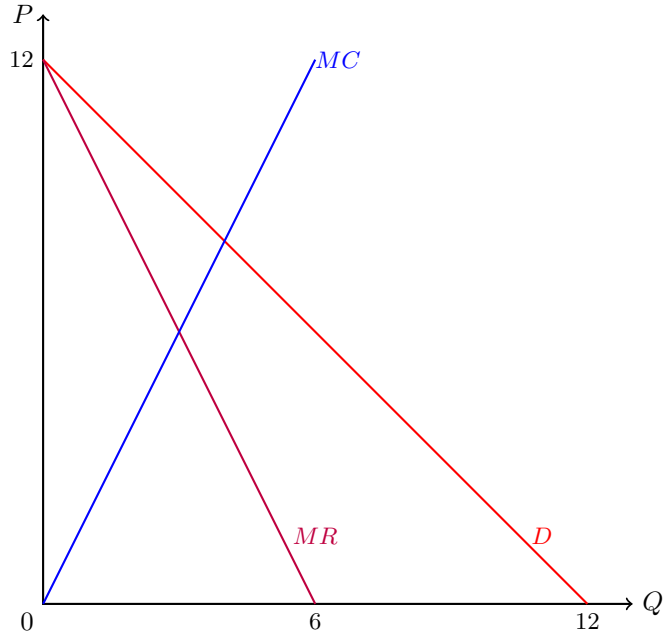
To get any point you must show your work

14. Chiquita has a banana Monopoly in the U.S. Suppose inverse market demand is $P = 12 - Q_D$, Chiquita's marginal cost is $MC = 2Q$ and its fixed cost is $FC = 6$.

(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).



Solution:



(b) Suppose Chiquita is a single price monopolist:

- Quantity is $Q_M =$ **3**.

- Price is $P_M =$ **9**.
- Producer surplus is $PS_M =$ **18**.
- Profit is $\pi_M =$ **12**.

Solution: The MR equation is $MR = 12 - 2Q$. To maximize its profit, Uber chooses the quantity that equates marginal revenue and marginal cost: $MR = MC \Rightarrow 12 - 2Q = 2Q \Rightarrow 4Q = 12 \Rightarrow Q = 3$. Then, to find the price that Uber chooses, it suffices to plug in the quantity chosen into the demand equation: $P = 12 - 3 = 9$. Its producer surplus is the area below P_M and above marginal cost, for all quantities up to Q_M: $PS = (9 - 6) \times 3 + 6 \times 3 \times 0.5 = 18$. Its profit is $\pi_M = PS - FC = 12$.

For the remainder of the exercise, suppose Chiquita's greedy practices are destroying the Rain Forest at a cost of $3 per banana.

(c) The *equation* of the marginal social cost is $MSC =$ $2Q + 3$.

(d) The socially efficient quantity is $Q_E =$ **3**.

Solution: To find the socially efficient quantity, it suffices to equate the social marginal cost and demand functions: $2Q + 3 = 12 - Q \Rightarrow 9 = 3Q \Rightarrow Q_E = 3$.

(e) The government wants to ensure Chiquita produces the socially efficient quantity of bananas. What would you suggest the government should do? Explain in the box below.

Solution: The efficient quantity is the same as the monopoly quantity, so the government does not need to use a tax nor a subsidy.

(f) Chiquita is considering the purchase of a technology that would allow it to perfectly price discriminate. With perfect price discrimination:

- Quantity is $Q_{PPD} =$ **4**.
- Producer surplus is $PS_{PPD} =$ **24**.
- Profit is $\pi_{PPD} =$ **18**.

The firm would be willing to pay a maximum amount of **6** to purchase the technology.

Solution: With PPD, marginal revenue is demand, so the quantity is such that $MR = MC$, i.e. demand intersects marginal cost: $12 - Q = 2Q$ so $Q_PPD = 4$. Producer surplus is the area below demand above marginal cost, for all quantities up to Q_{PPD}: $PS = 12 \times 4 \times 0.5 = 24$. Its profit is $\pi_M = PS - FC = 18$. The firm is willing to pay $\pi_{PPD} - \pi_M = 18 - 12 = 6$.

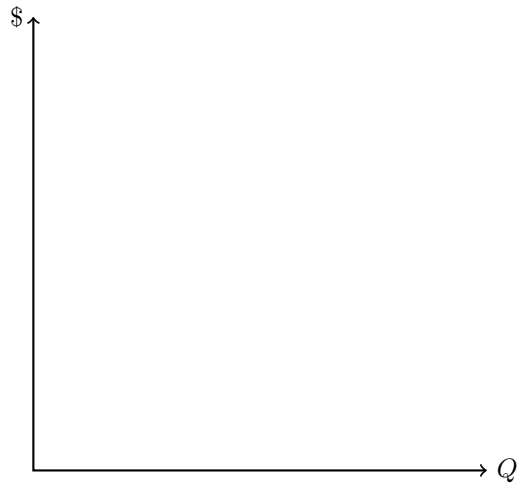
15. Abby, Beth and Chris are roommates. They all value safety locks for their apartment door. Suppose safety locks are a public good, with constant marginal cost $MC = 3$. The marginal benefits are given by:

Abby: $MB_A = 4 - Q$

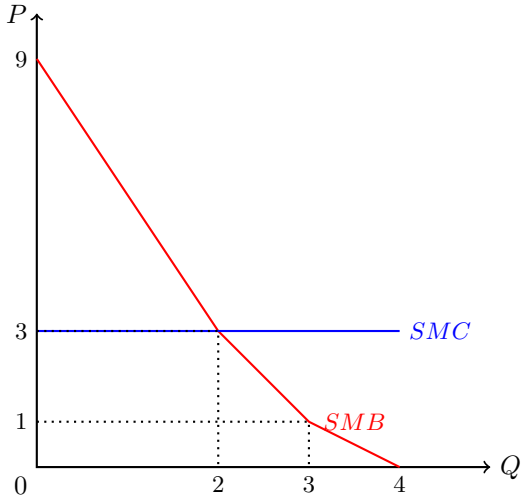
Beth: $MB_B = 3 - Q$

Chris: $MB_C = 2 - Q$

(a) In the graph below, plot the margina sociall benefit MSB ad marginal social cost MSC. Label the curves, as well as all intercepts and kinks' coordinates.



Solution:



$SMB = 9 - 3Q$ for $Q \leq 2$; $SMB = 7 - 2Q$ for $2 < Q \leq 3$; $SMB = 4 - Q$ for $3 < Q \leq 4$. Y-intercept is 9 and x-intercept is 4. There are two kinks at (2,3) and at (3,1).

(b) The socially efficient quantity is $Q_E =$ _____**2**_____.

Solution: This is the quantity such that $SMB = SMC$.

(c) The social surplus at the efficient quantity is equal to _____**6**_____.

Solution: This is the triangular area below SMB and above MC up to Q_E is equal to 6.

(d) Suppose the roommates' landlord imposes the same lump-sum fee on each of them to pay for the cost of the efficient quantity.

Each roommate will have to pay a lump-sum fee of _____**2**_____.

Solution: At the efficient quantity, total cost equals 6 (area below MC up $Q_E = 2$). Dividing the total cost by the number of roommates yield \$2 per roommate.

(e) Would each of the roommates agree to pay the lump-sum fee? Explain why or why not in the box below.

Solution: Everyone agrees since each of their total benefit exceeds the lump-sum fee. Chris' total benefit for Q_E is 2 (area below his marginal benefit curve up to $Q_E = 2$. If Chris' total benefit exceeds the lump sum fee, then he is willing to pay the lump-sum fee and so is everyone else.

16. Consider the town of Econtown. Econtown is famous for having only one employer, Pen Inc., which operates in the **perfectly competitive** output market for pens.

The market for pens can be described with a demand of $P = 8 - Q_D$ and supply of $P = Q_S$, where Q is in thousands of pens.

The workers have productivity $MP_L = 16 - \frac{L}{2}$ and are willing to supply labor according to S_L: $w = 4 + L_S$.

(a) Given the information above, the Marginal Revenue Product of Labor equation is $MRP_L =$ _____$64 - 2L$_____.

Solution: Output market equilibrium is such that $P^* = 4$. Thus $MRP_L = P^* \times MP_L = 4 \times (16 - L/2) = 64 - 2L$

(b) Pen Inc.'s marginal cost of labor is $MC_L =$ _____$4 + 2L$_____.

Solution: MC_L has the same y-intercept as labor supply but twice the slope.

(c) In the box below, solve for the equilibrium wage and employment in the labor market.

Solution: $MRP_L = MC_L$ implies $64 - 2L = 2L + 4$ which yields $L_M = 15$. Plugging L_M in labor supply yields $w_M = 19$.

(d) The two graphs below represent the output market (on the left) and the labor market (on the right).

- In figure 1, draw the output demand and supply. Label the equilibrium price P^* and quantity Q^*.
- In figure 2, draw MRP_L, S_L, and MC_L. Label the monopsony wage W_M and employment L_M.

For full credit, be sure to label all curves and intercepts.

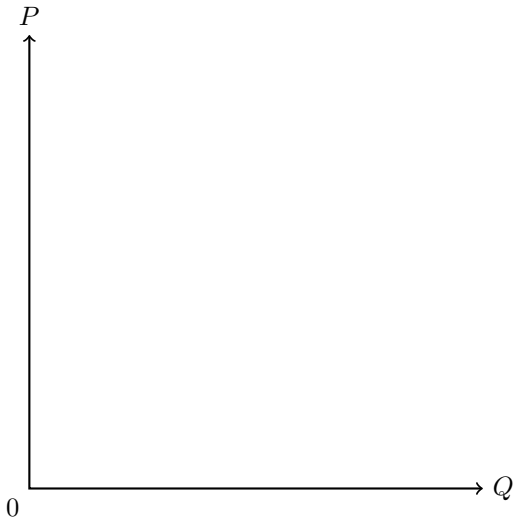


Figure 1: **Output Market**

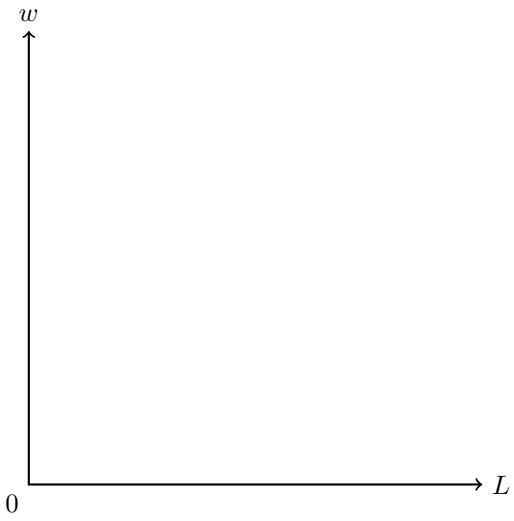
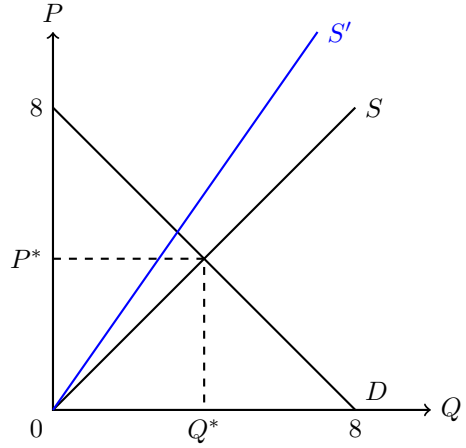
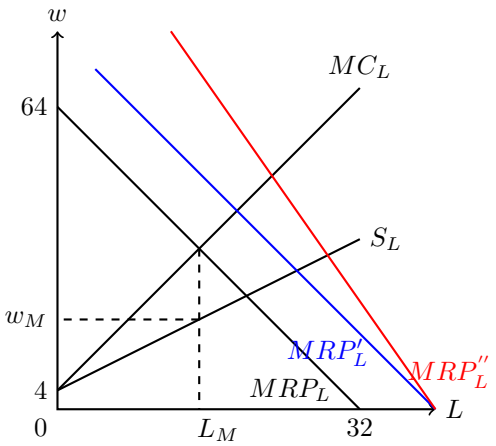


Figure 2: **Labor Market**

Solution:





(e) Now suppose that a new educational TV series is broadcast every Sunday, *An Hour with Dr. Buchene*, which leads to an increase in productivity for all workers. On the graphs above:

- Show the the change in the labor market (Figure 2). Label the new curve MRP'_L
- Show the direct effect on the output market (Figure 1). Label new curve(s) with a prime ($'$) symbol.
- Show the feedback effect on the labor market (Figure 2) as well. Label new curve(s) with a prime ($'$) symbol.

Assume that *An Hour with Dr. Buchene* gets cancelled for low ratings, so that marginal productivity is back to $MP_L = 16 - \frac{L}{2}$.

(f) The workers of Econtown have noted a poor standard of living. From widespread health code violations to a disappointing lack of Nice Spice (their favorite spice), they have decided to unionize in an effort to improve their work conditions. The first policy of this union is to set a minimum wage of $w_{min} = 36$. Given this policy:

- The new wage is _____**36**_____.
- The new level of employment is _____**14**_____.
- The new level of unemployment is _____**18**_____.

Solution: The minimum wage is binding, so the level of employment is such that $MRP_L = 36$, i.e. $64 - 2L = 36$ which yields $L = 14$. At the minimum wage, the labor supplied would be such that $w = 4 + L_S$, i.e. $L_S = w - 4 = 32$, so the level of employment is the excess supply, i.e. $32 - 14 = 18$.