

**ECON 001
Spring 2022
Final**

May 9, 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: 12 points)

- (1 point) Aaron is spending the weekend at his aunt's house in the Jersey Shore. Once there, he has three choices for how to spend his day. He can go to the beach with his friends, at a benefit of \$20 and no cost, he can see the new Boss Baby movie for \$15 but values it at \$25, or he can go to a picnic, where he will spend \$20 on food but would be willing to spend up to \$35 to go. What is the opportunity cost of going to the movies?
 - \$25
 - \$20
 - \$35**
 - \$10
- (1 point) Suppose Alice spends her income of \$10 on coffee and tea. She gets the same additional satisfaction from 2 cups of tea as she does from 1 cup of coffee. The current price of a cup of coffee is \$2.5 while a cup of tea costs \$2. What happens when the price of a cup of tea drops by \$1?
 - Alice's consumption of coffee and tea remains unchanged.
 - Alice consumes the same amount of coffee, but consumes 5 more cups of tea.
 - Alice consumes 4 cups fewer of coffee and 10 cups more of tea.**
 - Alice consumes the same amount of coffee, but consumes 2 more cups of tea.
- (1 point) In an economy with two goods, which of the following is true:
 - The cross-price elasticity of demand between the two goods must be positive
 - The income elasticity of demand must be positive for at least one good
 - The price elasticity of demand must be positive for at least one good

Only I **Only II** Only III I and II I and III II and III I, II and III
- (1 point) Suppose the market for coffee in Philadelphia is perfectly competitive and in a long run equilibrium. A new study comes out in The Daily Pennsylvanian that shows that higher coffee consumption leads to higher scores on tests. How does this study affect the new **long run** equilibrium?
 - The quantity of coffee produced by each coffee shop increases
 - The price of coffee increases
 - The average total cost (ATC) of the coffee shops increases
 - None of the above is true**
- (1 point) Amid the coronavirus pandemic, the price of eggs increased from from \$1.01 to \$3.07 per dozen. Suppose the government decides to subsidize eggs to bring the price paid by consumers down to pre-pandemic levels. Assuming upward sloping supply and downward sloping demand in the market for eggs, the subsidy will be:
 - \$2.06 per dozen
 - More than \$2.06 per dozen**
 - Less than \$2.06 per dozen
 - There is not enough information to identify the level or range of the subsidy
- (1 point) Using the information from question 5, and assuming no externalities, we should expect the subsidy to:

- I. Increase consumer surplus
- II. Increase producer surplus
- III. Increase total surplus

Only I
 Only II
 Only III
 I and II
 I and III
 II and III
 I, II and III

7. (1 point) Economic opportunities in District 12 are limited to two activities: hunting squirrels and baking bread. The skill profiles of two young members of this impoverished community are displayed in the following table:

Individual	Squirrels per day	Loaves per day
Katniss	6	6
Peeta	4	12

If they want to jointly produce 8 squirrels, how many squirrels should each of them produce?

- Katniss: 2; Peeta: 6
- Katniss: 6; Peeta: 2**
- Katniss: 4; Peeta: 4
- Katniss: 3; Peeta: 5
- Katniss: 5; Peeta: 3

8. (1 point) Consider the perfectly competitive market for bicycles, with market demand $P_D = 100 - 2Q_D$ and a perfectly elastic supply $P = \$50$. Riding a bicycle reduces pollution and congestion, so consumers generate a marginal external benefit $MEB = \$10$. Suppose the government grants a subsidy to consumers of \$10 per bike purchased. Which of the following is true?

- Without the subsidy, too many bicycles are sold in the market compared to the socially efficient quantity.
- Without the subsidy, the market generates a deadweight loss of \$25.**
- With the subsidy, the market generates a deadweight loss of \$25.
- The total cost of the subsidy to the government is \$250

9. (1 point) Which of the following is *always true* about the quantity produced by a monopoly:

- I. It is inefficient because it generates a deadweight loss.
- II. It is inefficient because it under-produces.
- III. It can be efficient if there is a positive externality.
- IV. It is such that demand is inelastic.

- I and II
- I, II and IV
- I, III and IV
- only IV
- none of the above**

10. (1 point) Columbia Propulsions is a firm that makes jet engines with a marginal cost strictly higher than 0. Suppose market demand for jet engines is linear and downward sloping. Columbia Propulsions is a monopoly, but has the goal of maximizing revenue. Which of the following is true?

- It produces where the elasticity of demand is less than 1
- It produces where the elasticity of demand is 1**
- It produces where the elasticity of demand is greater than 1
- Any of the above could be true

11. (1 point) Consider the following payoffs matrix (player 1 is the column player and player 2 is the row player, payoffs are written as (P_2, P_1))

		Column		
		<i>L</i>	<i>M</i>	<i>R</i>
Row	<i>T</i>	0, 1	2, 2	3, 0
	<i>M</i>	3, 2	2, 3	0, 1
	<i>B</i>	4, 1	2, 2	0, 0

Which of the following is true:

- There is a unique Nash Equilibrium.
- The game is an example of a prisoner's dilemma.
- All Nash Equilibria are Pareto Efficient
- Both players have a dominant strategy
- The column player has a dominant strategy**

12. (1 point) Josh's preferences for leisure are such that his substitution effect is always stronger than his income effect for any changes in his hourly wage. For Josh, which of the following statements is always true?

- An increase in wage makes Josh want to work less
- An increase in wage makes Josh want to work more**
- An increase in wage makes Josh want to work more is his wage is relatively low, and less if his wage is relatively high
- We don't have enough information to tell.

13. (1 point) Which of the following statement is correct?

- As income inequality increases, the Gini coefficient decreases
- As income inequality inequality decreases, the Lorenz curve gets closer to the 45 degree line**
- The greater the area between the 45 degree line and the Lorenz curve, the less income inequality
- If the area between the 45 degree line and the Lorenz curve is 0.3 and the area beneath the Lorenz curve is 0.2, the Gini coefficient is $\frac{2}{5}$.
- If more than half of society has less than half of the total income, then the Gini coefficient must be less than 0.5.

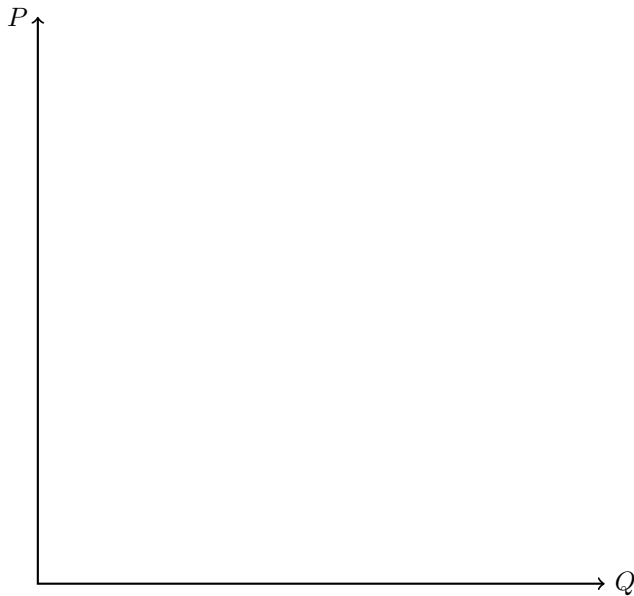
Short Answer Questions (28 points total)

To get any point you must show your work

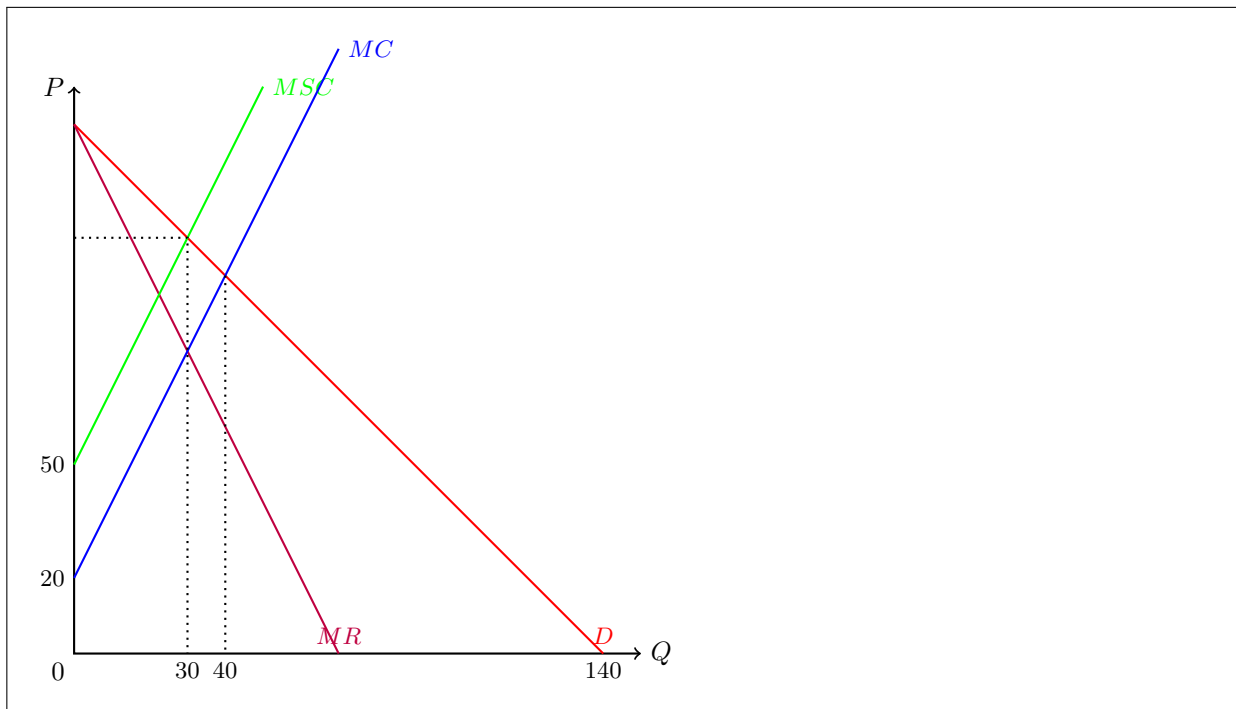
14. Consider a single price monopolist producing electric vehicles with fixed cost $FC = 600$ and marginal cost $MC = 20 + 2Q$. Market demand is $D = 140 - Q$.

(a) The monopolist's marginal revenue equation is $MR = \underline{\hspace{2cm} 140 - 2Q \hspace{2cm}}$

(b) Draw the marginal cost, marginal revenue and demand curve on the graph. Label all intercepts and curves.



Solution:



- (c) Suppose the monopolist maximizes its profit. The monopoly quantity is $Q_M =$ 30 and the monopoly price is $P_M =$ 110.

Solution:

$$\begin{aligned}
 MR &= MC \\
 140 - 2Q &= 20 + 2Q \\
 120 &= 4Q \\
 Q^M &= 30 \\
 P^M &= 140 - 30 = 110
 \end{aligned}$$

- (d) The monopolist's profit is $\pi_M =$ 1200

Solution:

$$\begin{aligned}
 \pi &= \text{Producer Surplus} - TC \\
 &= (110 - 80)30 + \frac{1}{2}(80 - 20)30 - 600 \\
 &= 30(30) + \frac{1}{2}(60)(30) - 600 \\
 &= 2(30)(30) - 600 \\
 &= 1200
 \end{aligned}$$

- (e) The socially efficient quantity is $Q_E =$ 40

Solution:

$$20 + 2Q = 140 - Q$$

$$3Q = 120$$

$$Q^* = 40$$

- (f) Suppose the government wants the profit maximizing monopolist to produce the efficient quantity. Should the government impose a per unit tax or a subsidy? How large should the tax or subsidy be?

The government should impose a per-unit subsidy (*tax/subsidy*) equal to 40.

Solution:

$$MC - S = MR$$

$$20 + 2Q - S = 140 - 2Q$$

$$S = 4Q - 120$$

$$S = 160 - 120 = 40$$

- (g) It turns out that to produce electric vehicles, the monopolist needs to mine cobalt for the batteries, leading to a negative production externality of \$30 per car.

i. The marginal social cost equation is $MSC = 50 + 2Q$.

ii. Draw the marginal social cost on the graph.

iii. Given the externality, the socially efficient quantity is now $Q'_E = 30$.

Solution:

$$MSC = MSB$$

$$50 + 2Q = 140 - Q$$

$$3Q = 90$$

$$Q^E = 30$$

- iv. To ensure that the profit maximizing monopolist will produce the new socially efficient quantity, should the government now impose a per-unit tax or subsidy? How large should the tax or subsidy be? Answer and explain in the box below.

Solution: The monopolist produces $Q_M = 30$ which is the efficient quantity given the externality. There is no need for a tax or subsidy.

- v. How will your answer to part (iv) change if the monopolist is able to perfectly price discriminate? Answer and explain in the box below.

Solution: With PPD, the monopolist produces 40, so the government needs to impose a per-unit tax t such that demand intersects $MC + t$ at $Q'_E = 30$, i.e. $140 - Q'_E = 20 + 2Q'_E + t$, so $t = 30$.

15. Philadelphia Parks & Recreation has a service that plants trees in front of property owners' homes. Consider a city block with 20 home owners, who value trees differently: 10 of them are of type "H" with an individual marginal benefit $MB_H = 10 - 2Q$, while the 10 others are of type "L" with an individual marginal benefit $MB_L = 5 - Q$, where Q is the number of trees planted on the block. The marginal cost of planting a tree is constant and is equal to $MC = 30$.

- (a) The socially efficient number of trees planted on the block is $Q_E =$ 4.

Solution: $MSB = 10 \times MB_H + 10 \times MB_L = 10(10 - 2Q) + 10(5 - Q) = 150 - 30Q$. Efficiency requires $MSC = MSB$, so $30 = 150 - 30Q$ which yields $Q = 4$ trees.

- (b) Suppose that Philadelphia Parks & Recreation wants collect the same fixed fee from each homeowner, in order to finance the efficient number of trees.

Each resident would have to pay a fee equal to 6.

Solution: The total cost of 4 trees would be $4 \times 30 = 120$, so each homeowner would have to pay $\frac{120}{20} = 6$.

- (c) Would all homeowners agree with the fee you found in part (b)? Answer and explain in the box below.

Solution: The total benefit of each homeowner is the area below the marginal benefit, up to $Q_E = 4$. Homeowners of type "H" are willing to pay $(8 - 2) \times 4 \times 0.5 + 2 \times 4 = 24$, while homeowners of type "L" are willing to pay $(5 - 1) \times 4 \times 0.5 + 1 \times 4 = 12$. So all homeowners are willing to pay more than 6, so they would all agree with the fee.

16. Consider Mushroom Farm, a producer in the perfectly competitive market for magic mushrooms, where market demand is $P = 10 - Q_D$ and market supply is $P = Q_S$. Mushroom Farm hires workers in two towns: Town A and Town B. In both towns, the marginal productivity of labor is given by $MP_L = 6 - 0.1L$ and the supply of labor is given by $w = 0.5L_S$.

- (a) Write the equation of the Marginal Revenue Product of Labor in each town: $MRP_L =$ $30 - 0.5L$.

Solution: The equilibrium price in the output market is $P^* = 5$, so $MRP_L = MP_L \times P^* = 30 - 0.5L$.

- (b) Suppose that the labor market in Town A is perfectly competitive.

The equilibrium wage is $w_A =$ 15 and the level of employment is $L_A =$ 30.

Solution: We set $MRP_L = L_S$ and arrive to $30 - 0.5L = 0.5L$, so $L_A = 30$ and $w_A = 15$.

- (c) Suppose that the labor market in Town B is a monopsony, with a marginal cost of hiring labor $MC_L = L$. The equilibrium wage is $w_B =$ 10 and the level of employment is $L_B =$ 20.

Solution: We set $MRP_L = MC_L$ so $30 - 0.5L = L$ so $L_B = 20$ and $w_B = 10$.

- (d) In which town there is more unemployment? Explain in the box below.

Solution: There is zero unemployment in either town, since there the quantity of labor demanded is equal to the quantity of labor supplied at equilibrium each wage.

- (e) Suppose that the government grants Mushroom Farm monopoly power in the market for magic mushrooms. Describe in words in the box below how this would affect Mushroom Farm's demand for labor, and what would happen to the equilibrium wage and labor hired.

Solution: Labor demand rotates inwards, labor decreases and so does the wage.