ECON 001
Spring 2020
Midterm 1
Feburary 18, 2020
Time Limit: 60 Minutes

Name (Print): _____

Penn ID number: _____
(8 digits)

- This exam contains 7 pages (including this cover page) and 10 questions. Check to see if any pages are missing.

- The exam is scheduled for 1 hour.

- This is a closed-book, closed-note, no calculator exam.

- Answer each multiple choice question by writing the correct answer on the line at the right margin of the corresponding question. Make sure that your answer is clearly written or it will be marked incorrect.

- Write your answers to the other questions in the spaces provided below them. If you don't have enough space, continue on the back of the page and state clearly that you have done so.

- Do not remove any pages or add any pages. No additional paper is supplied

- Show your work when applicable. Use diagrams where appropriate and label all diagrams carefully.

- You must use a pen instead of a pencil to be eligible for remarking.

- 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 7 out of 8: 35 points)

1. (5 points) Adrian paid $1000 for campus parking which is 50% refundable upon cancelation. Feeling the need to exercise a bit more, Adrian is now considering canceling his campus parking and biking to school. Buying a new bike would cost him an additional $200. He values biking to work at $500. What is his opportunity cost of driving to work?

   ○ $300
   √ **$800**
   ○ $1,000
   ○ $0
   ○ Not enough information to calculate

2. (5 points) The market for kiwis has downward sloping demand and upward sloping supply. Which of the following could independently explain a decrease in the equilibrium quantity of kiwis?

   I. The wages of kiwi pickers increases.
   II. Consumer incomes fall, and kiwis are a normal good for all consumers.
   III. Excessive rainfall causes an unexpected increase in the supply of kiwis.

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

3. (5 points) Peter gets the same additional satisfaction from 3 cookies as he does from 1 chocolate bar at any level of consumption. Which of the statements is NOT true?

   √ **If the price of a chocolate bar is twice the price of a cookie, he will only buy cookies.**
   ○ His marginal rate of substitution is constant.
   ○ His indifference curves are linear.
   ○ Cookies and chocolates are perfect substitutes.

4. (5 points) Adam consumes two goods, apples and bananas. Apples, for Adam, are an inferior good. If the price of apples decreases, what can we say about his consumption of bananas?

   ○ Adam will consume more bananas than before
   ○ Adam will consume fewer bananas than before
   √ **His change in banana consumption is indeterminate**
   ○ Adam will consume more at first and then less.

5. (5 points) Tom's demand for organic apple juice is inelastic and downward sloping. At a price of $2 per bottle Tom demands 10 bottles. Suppose now the price increases to $4 per bottle. Which of the following statements are consistent with this information?

   I. Tom's expenditure on organic apple juice decreases.

   II. The absolute value of Tom's price-elasticity is at least 1.

   III. At the new price, Tom demands 4 bottles.

   IV. At the new price, Tom demands 6 bottles.

   ○ I only

   ○ II only

   ○ III only

   √ **IV only**

   ○ I and II

   ○ I and IV

   ○ III and IV

6. (5 points) A bakery has total costs $TC(q) = 10 + 2q + q^2$. Which of the following are possible short-run profits at which the bakery should continue to operate in the short run?

   ○ 2

   ○ 0

   ○ -5

   ○ -9

   √ **All of the above**

7. (5 points) A local market for bananas has demand $Q_D = 10 - P$ and supply $Q_S = P$. An unexpected fire reduces the quantity supplied at every price by 2 units. Which of the following is the producer surplus after the fire?

   ○ 12.5

   √ **8**

   ○ 16

   ○ 10

8. (5 points) Consider the perfectly competitive market for potted cacti, which was in long-run equilibrium. Then, an "event" occurred. Now, the market has returned to long-run equilibrium, with a price higher than it was at the start. Which of the following could have been the "event" that could explain this spike in the long-run equilibrium price?

   ○ The invention of the Cacti-glove$^{\text{TM}}$, which reduced labor costs associated with handling cacti

   √ **The exceptionally dry winter caused cacti (fixed) storage costs to increase**

   ○ The CDC issued a statement that cacti are excellent at purifying the air in your home

   ○ All of the above

Short Answer Questions (65 points total)

To get any point you must show your work

9. Ava has budgeted $240 per month for her hobbies which include watching plays or taking archery lessons. She likes both activities, and consumes positive quantities of each. The price of a ticket to a play is $40 and the price of an archery lesson is $20.

   (a) Draw her Budget constraint in the graph below.
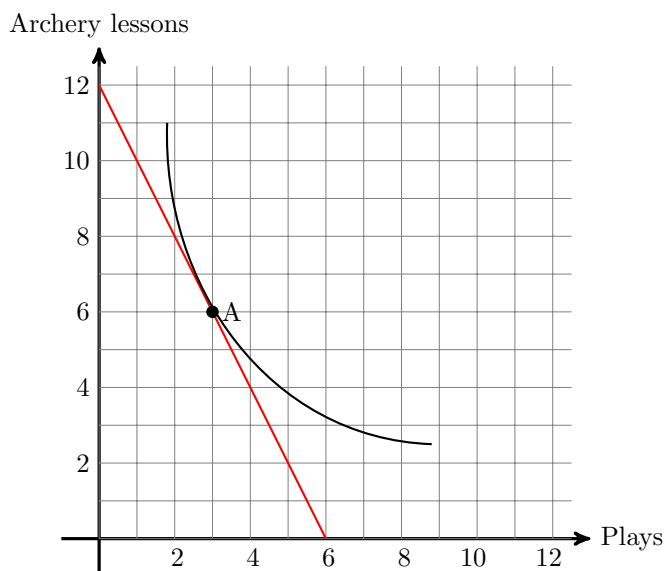
   Archery lessons

   (*Fill-in the blanks*). The y-intercept of her budget constraint is _____**12**_____ Archery lessons, and the x-intercept of her budget constraint is_____**6**_____ plays.

   (b) Suppose her optimal consumption is (3 plays, 6 archery lessons). Mark her optimal consumption point A and draw a typical indifference curve through A (assuming regular preferences for the two goods).

   > **Solution:** See graph from part (a)

   (c) Suppose that if Ava's income increases to $260, she purchases (2 plays, 9 archery lessons), while if her income decreases to $220, she purchases (4 plays, 3 archery lessons).

   According to this information, in this range of income, what type of goods are plays and archery lessons for Ava?

   • Ava views plays as a(n) _____**inferior**_____ good

   • Ava views archery lessons as a(n) _____**normal**_____ good

(d) Based on your answer to part (c), describe the substitution effect and the income effect of an increase in the price of archery lessons:

(Fill in the blanks with "increase" or "decrease"). If the price of archery lessons increases:

- The substitution effect will:

    – _____**decrease**_____ her consumption of archery lessons

    – _____**increase**_____ her consumption of plays.

- The income effect will:

    – _____**decrease**_____ her consumption of archery lessons

    – _____**increase**_____ her consumption of plays.

(e) Suppose that prices and Ava's income are the same as initially (income is $240, the price of a play is $40 and the price of an archery lesson is $20). However, her preferences have changed: now she always gets the same additional satisfaction from one archery lesson as she does from one play.

Given her new preferences, her optimal consumption is _____**0**_____ plays and _____**12**_____ archery lessons.

(f) Suppose Ava still has the same preferences as in part (e), but prices change, such that her new optimal consumption is now (3 plays, 5 archery lessons).

Given this information, the price of an archery lesson is now _____**$30**_____ and the price of a play is now _____**$30**_____.

(g) Suppose Ava's demand for archery lessons is given by : $P = 50 - 5Q_D$. What is her consumer surplus if the price of an archery lesson is back to $20? *Show your work in the box below your answer.*

Her consumer surplus is _____**$90**_____

> **Solution:** The demand "choke price" is $50. At a price of $20, she buys 6 lessons. Her consumer surplus is the triangle below her demand curve and above the price of $20: $CS = (50 - 20) \times 6 \times 0.5 = \$90$

10. Suppose that the market for all-terrain vehicles (ATVs) is perfectly competitive, with the inverse demand function:

$$P = 510 - Q_D$$

Each firm in the industry faces Cost and Marginal Cost functions:

$$TC(q) = q^2 + 150q + 400, \quad MC(q) = 2q + 150$$

(a) Write out equations for the Fixed Cost (FC), Average Variable Cost (AVC(q)), and Average Total Cost (ATC(q)).

Fixed cost: $FC =$ _____400_____

Average variable cost: $AVC(q) =$ _____$q + 150$_____

Average total cost: $ATC(q) =$ ___$q + 150 + \frac{400}{q}$___

(b) Suppose the industry is currently in long-run equilibrium. Find the individual quantity produced by each firm, q, and the market price, p. *Show your work in the box below your answer.*

The individual quantity is $q =$ _____**20**_____ and the market price is $p =$ _____**$190**_____

> **Solution:** The market is in LR equilibrium, thus we have the zero-profit condition of $ATC(q) = MC(q) = p$. Setting $ATC(q) = MC(q)$, we obtain
>
> $$q + 150 + \frac{400}{q} = 2q + 150 \implies q = 20$$
>
> Plugging in $q = 20$ into MC or ATC gives us $p = \$190$

(c) How many firms, N, are currently in the industry? *Show your work in the box below your answer.*

There are $N =$ _____**16**_____ firms.

> **Solution:** Taking the market price $p = \$190$ and plugging into Inverse Demand, we obtain market demand Q. $190 = 510 - Q \implies Q = 320$. Taking market quantity and dividing by $q = 20$, we obtain
>
> $$N = \frac{320}{20} = 16 \text{ firms.}$$

(d) Should any firms enter or exit the market? Explain in the box below.

> **Solution:** No, each firm in the market is currently making an economic profit of 0, thus no firm has an incentive to enter or exit.

(e) Suppose the government decides to impose strict safety standards on ATV producers, who now have to pay a yearly fee for safety certification of their vehicles.

    i. In the graphs below, show how this change will affect the market (left hand side) and the individual firm (right hand side). More specifically, show the initial long-run equilibrium (with price P_{LR}, market quantity Q_{LR} and individual quantity q_{LR}), and the change to the new long-run equilibrium (with price P'_{LR}, market quantity Q'_{LR} and individual quantity q'_{LR}).
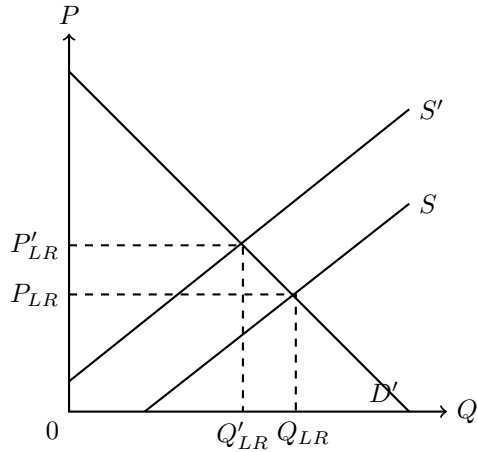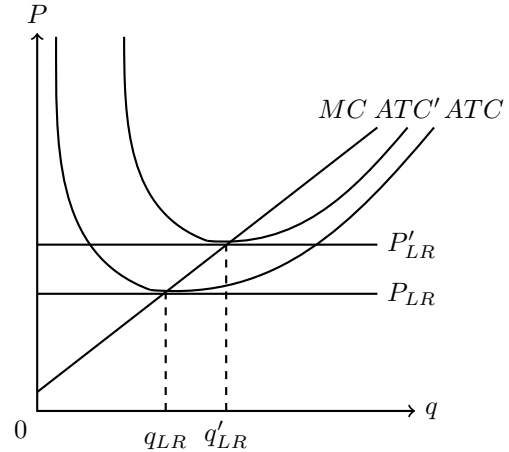

Figure 1: **Market**

Figure 2: **Individual Firm**

    ii. Explain (in words) how the new long run equilibrium compares with the initial long run equilibrium:

In the new long run equilibrium:

- the number of firms is   **lower**

- the price is   **higher**

- the market quantity is   **lower**

- each firm's profit is   **the same**