Name: _____ **KEY** _____

100 points total. Point values for each question are as indicated. Answer each question in the space provided. General advice: show your work, including any formulas or diagrams that you use in reasoning through your answers.

1. (15 pts.) Two things have been occurring in the U.S. market for garlic lately (*WSJ* 2/21/20). First, garlic flavoring, commonly used in ethnic cuisines, has been growing in popularity. Second, the coronavirus outbreak has disrupted supply chains worldwide, especially in China where most of the garlic sold in the U.S. comes from. A sleeve of garlic, typically five bulbs, cost an average of $1.42 in early February, up from $1.00 in July 2019. Using demand and supply analysis, illustrate and briefly explain what has been going on in the garlic market.

15

Garlic Market   5 bulbs
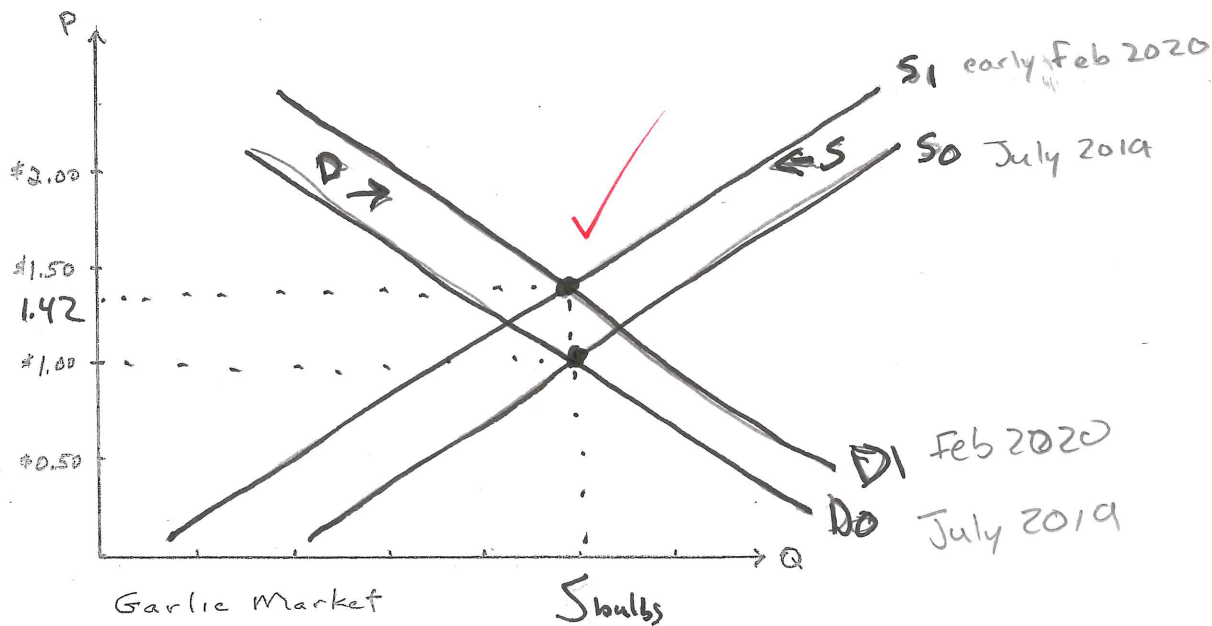
Taste growing in popularity has Produced an increase in demand for garlic. Represented as a shift to the right of the demand curve. The Sars CoV₂ outbreak created a disruption in supply of. Represented by a shift left of the supply curve. Both increased demand + increase in scarcity of garlic places upward pressure on price.

2. (20 pts.) Kroger's observes that when it reduces the price of Bud Light beer (30 pack of 12 oz. cans) from \$24.99 to \$22.99, daily sales in a typical store increase by 25%. Calculate own-price elasticity of demand for Bud Light and explain how to interpret the number you get for your answer.

$$E_{X, P_X} = - \frac{.25 \quad \text{(crossed out)}}{(22.99 - 24.99)/[\frac{1}{2}(22.99 + 24.99)]} \quad \to \%\Delta X_D \to \%\Delta P_X$$

$$= \frac{.25}{-2/23.99}$$

$$= \frac{.25}{.083}$$

$$\boxed{E_{X, P_X} = 3.01} \quad \checkmark$$

Since the own price elasticity of Bud Light is >1, this good is extremely elastic; consumers are very sensitive to a change in price of Bud Light. Therefore, if Bud Light decreases their price like this, their revenues will increase.

Kroger's also observes that when they put Bud Light on sale as described above, a typical Kroger's store experiences a decline in daily sales of Miller Lite beer 30-packs from 50 to 40. Calculate cross-price elasticity of demand between Bud Light and Miller Lite, and interpret your answer.

20

$$E_{X, P_Y} = \frac{(40-50)/(40+50)}{(22.99-24.99)/(22.99+24.99)} \quad \to \%\Delta X_D \to \%\Delta P_Y$$

$$= \frac{-10/90}{-2/47.98}$$

$$= \frac{-.11}{-.042}$$

$$\boxed{E_{X, P_Y} = 2.62} \quad \checkmark$$

Since the cross-price elasticity of demand between Bud Light & Miller Lite is >0, these goods are substitutes. Since E_{X, P_Y} is significantly greater than 0, they are close substitutes. Therefore, when the price of Bud Light decreases, demand for Miller Lite decreases.

3. (15 pts.) Your friend Esmeralda works as a line cook at a local restaurant, earning $45,000 per year. Feeling entrepreneurial, she is inspired to start her own business. She decides to open a food truck and serve food to the campus lunch crowd. After operating this business for a year, she shares the following information with you and asks for your assessment of its profitability. She opens her publicly audited books to you and you see $200,000 in revenues each year from food sales. You also see $30,000 in labor costs for hourly workers who help her run the business, $80,000 in wholesale food costs, $10,000 for gas and maintenance on the truck, $20,000 for insurance, taxes, and business license fees, and $5,000 for advertising and web site expenses. What are Esmeralda's accounting profits?

Revenue   200,000
wages   30,000 ⎤
COGS   80,000 ⎥
gas, etc.   10,000 ⎥ - explicit costs
inf., taxes 20,000 ⎥
SG&A   5,000 ⎦
           _____
           145,000

Accounting Profits = revenue - explicit costs
= 200,000 - 145,000
= 55,000 ✓

Esmeralda invites you to work alongside her for a while to help you assess other factors relevant to her business. You learn the following things. She works full time in her food truck but takes her compensation in the form of profits instead of paying herself a salary. Esmeralda owns her truck outright. Fully outfitted food trucks like hers cost $75,000 when new, and have an expected life of five years, at which point they are worth nothing. Prior to buying her food truck Esmeralda had the $75,000 parked in an indexed mutual fund where she earned 5%. What do you think of this business opportunity? Answer by calculating Esmeralda's economic profits (or losses), carefully explaining your logic.

15

implicit costs: forgone salary   45,000
                 forgone interest   3,750   → Truck dep. 75,000/5
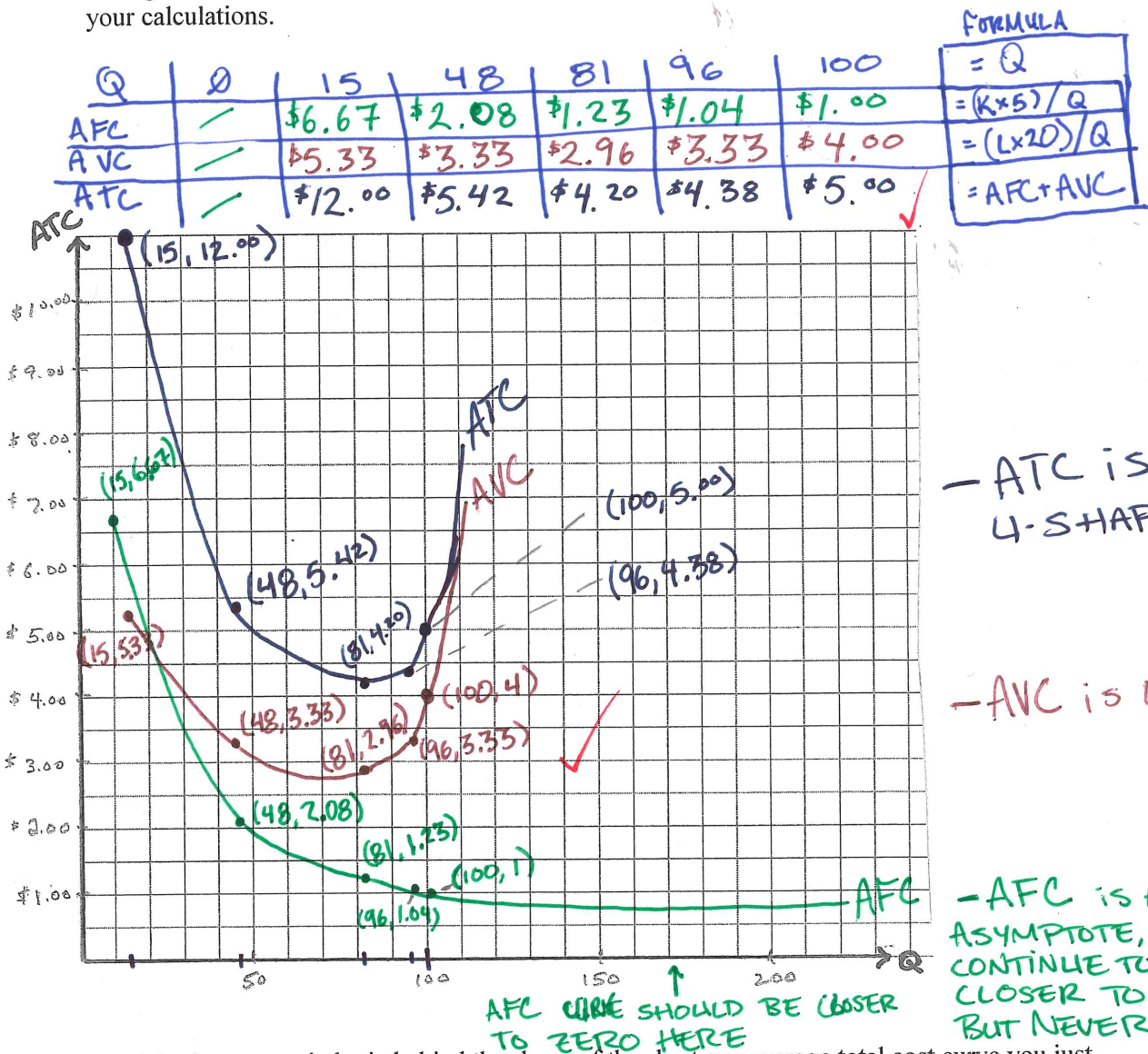   depreciation   15,000   = 15,000
                                    _____
                                     63,750

Economic profit: Revenue - explicit costs - implicit costs
= 200000 - 145,000 - 63,750
= -8750 ✓

Accounting profits are positive, but economic profits are negative when you factor in the depreciation of the food truck. She should probably sell the truck & return that money to her mutual fund.

4. (20 pts.) The following table describes the short-run production relationship for a firm that produces a single output, Q, with two inputs, L and K:

K	20	20	20	20	20	20
L	0	4	8	12	16	20
Q	0	15	48	81	96	100

Suppose that the wage rate is $20 and the rental rate on each unit of capital is $5. Using information from the table above, sketch the firm's average fixed cost, average variable cost, and average total cost curves in the diagram below, showing specific points on each curve based on your calculations.

Q	0	15	48	81	96	100	FORMULA
							= Q
AFC	/	$6.67	$2.08	$1.23	$1.04	$1.00	= (K×5)/Q
AVC	/	$5.33	$3.33	$2.96	$3.33	$4.00	= (L×20)/Q
ATC	/	$12.00	$5.42	$4.20	$4.38	$5.00 ✓	= AFC+AVC

ATC

(15, 12.00)

$10.00

$9.00

$8.00

(15, 6.67)

$7.00

ATC

AVC

$6.00

(100, 5.00)

(48, 5.42)

(96, 4.38)

$5.00 (15, 5.33)

(81, 4.20)

$4.00

(48, 3.33)

(100, 4)

$3.00

(81, 2.96)

(96, 3.35)

(48, 2.08)

$2.00

(81, 1.23)

(100, 1)

$1.00

(96, 1.04)

AFC

50   100   150   200   Q

20

AFC CURVE SHOULD BE CLOSER
TO ZERO HERE

— ATC IS ALSO
U-SHAPED

— AVC IS U-SHAPED

— AFC IS AN
ASYMPTOTE, WOULD
CONTINUE TO GET
CLOSER TO ZERO
BUT NEVER REACH IT.

Explain the economic logic behind the shape of the short-run average total cost curve you just drew above.

WHILE AVERAGE FIXED COST IS AN ASYMPTOTE & WILL CONTINUE TO NEAR ZERO AS MORE UNITS ARE PRODUCED, AVERAGE VARIABLE COST EVENTUALLY REACHES MINIMUM EFFICIENT SCALE (AT 81 UNITS), & VARIABLE COST PER UNIT BEGINS TO RISE AS MORE UNITS ARE PRODUCED. IT IS FOR THIS REASON THAT AVERAGE TOTAL COST, WHICH = AFC+AVC, IS ALSO U-SHAPED.

5. (15 pts.) Firms can produce either good X or good Y separately, or jointly produce both X and Y together The production technology displays the following costs, where C(i, j) represents the long-run total cost of producing i units of X and j units of Y:

C(5,0) = 125 $125 /5 = $25   C(0,50) = 225 $225/50 = $4.50
C(10,0) = 275 $275/10 = $27.50   C(0,100) = 400 $400/100 = $4.00
C(5,50) = 330   C(10,100) = 670

a. Does this production technology display economies of scale in the production of good X?
Graph two points on the LRAC for a firm that specializes in good X.
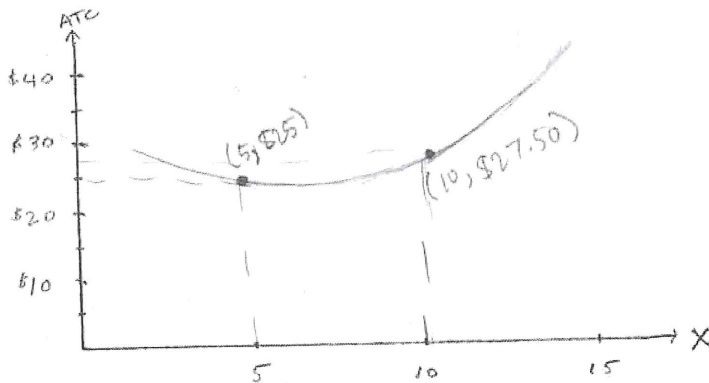
No. To produce the first 5 X's, it costs $125. To produce the next 5 X's, it costs $150, for a total of $275 for 10 X's. It is getting more expensive with more production, therefore it is a diseconomy of scale ✓

b. Does it display economies of scale in the production of good Y? Graph two points on the LRAC for a firm that specializes in good Y.
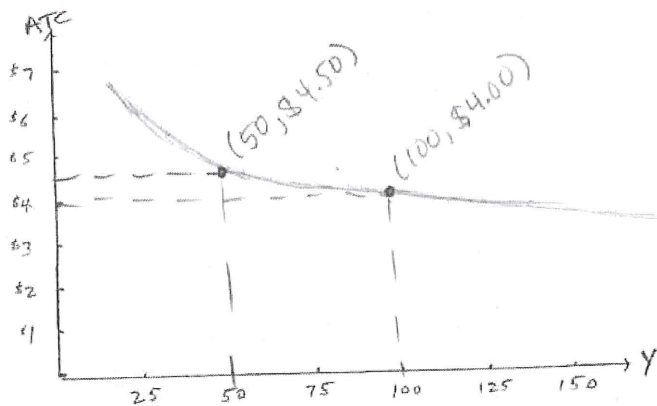
Yes. To produce the first 50 Y's, it costs $225. To produce the next 50 Y's, it costs $175 for a total of $400 for 100 Y's. It is getting less expensive per Y added, thus it is an economy of scale. ✓

15

c. Does it display economies of scope? Do you expect to see firms specializing in either good X or good Y or firms producing both goods simultaneously? And what size farms, small or large?

I would expect to see small X-only farms, large Y-only farms, and small to medium X and Y farms. This is because
x-only = diseconomy of scale
Y-only = economy of scale
both = economy of scope but not

good!

Small production:
Producing only 5 X's costs $125.
Producing only 50 Y's costs $225.
These individual costs added together sum $350.
Producing both 5 X's and 50 Y's costs $330.
So, for small production, producing both is an economy of scope ✓

Large Production:
Producing only 10 X's costs $275.
Producing only 100 Y's costs $400.
These individual costs sum $675.
Producing both 10 X's and 100 Y's costs $670. ✓
This shows that it is still technically an economy of scope, but less so than before. This would suggest a diseconomy of scale when the two are produced together.

6. (5 pts.) The Kentucky Lottery Commission has found that the income elasticity of demand for lotto tickets is -1.5 when the Powerball jackpot is less than $100 million, but is 0.8 when the jackpot rises above $100 million. Use that information and briefly explain how they should market the lotto game depending on the size of the jackpot.

5

$$\varepsilon_{x, income} = \frac{(\% \Delta X_D)}{(\% \Delta Income)} = -1.5 \; @ <100M$$
$$= 0.8 \; @ \; >100M$$

Demand decreases when income increases (Inferior good)

Demand increases when income increases (Normal good, necessity)

✓ When the jackpot is <$100M they should target advertising to lower income areas. People with lower income would be more likely to purchase.

✓ When the jackpot is higher @ >$100M the focus should switch to higher income customers. Advertise on media higher income would be more likely to see.

7. (5 pts.) Can you illustrate why Jeffersonville, OH doesn't have any fast-food restaurants, using the concepts of LRAC and market demand?
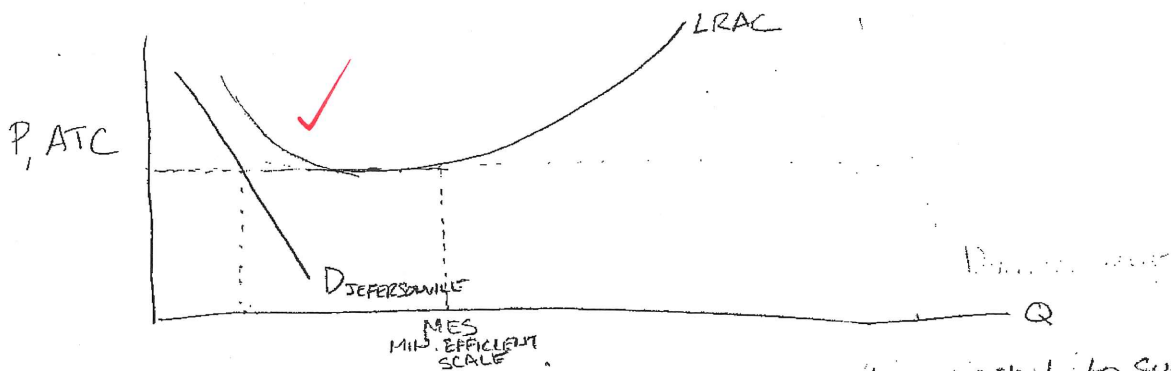
Jeffersonville's ~~too~~ small population does not have the market to support any fast food with efficient operations.

5

8. (5 pts.) Give an example of an airplane part that Boeing or Airbus has recently decided to make rather than buy and briefly explain why.

5

✓ They are trying to secure their supply chain for specialized parts. By bringing the part production in-house they can prevent external suppliers from holding them hostage on price if the supplier's business is at risk or wants to make more money on the highly specialized parts. Parts are also a very large portion of the total cost of the airplane.