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.) "Shrinking Crop Lifts Cocoa. Global prices are rising as processors chase the limited beans from Ghana on the market. Dry weather and the late application of pesticides and fungicides to protect cocoa trees have caused Ghana's crop to shrink significantly." (*WSJ* 6/20/15).

(a) Illustrate and briefly explain using supply and demand analysis what is happening in the world market for cocoa, of which Ghana is a major supplier. Cocoa is the primary ingredient in chocolate.
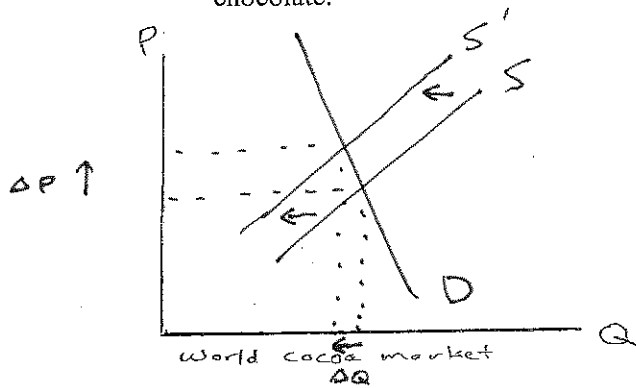

Dry weather and late application of pesticides have caused market supply to decrease. Supply curve shifts left, leading to higher cocoa prices.

(b) Hershey's stock price has fallen from $110 in January 2015 to $90 in June. Explain why using a supply and demand analysis of the market for chocolate candy (which is Hershey's primary product.)
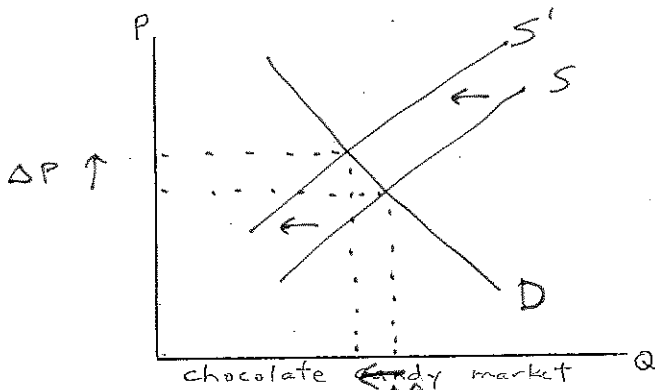
Increase in the price of an input (cocoa) causes supply curve for chocolate candy to shift left ⟹ higher prices and reduction in quantity demanded of Hershey bars.

(c) Your professor is wondering whether or not to buy stock in Perfetti van Melle, a company that manufactures toffee, caramel, gummies, licorice, and Mentos. Justify your answer with a supply and demand analysis of the market for non-chocolate candies.
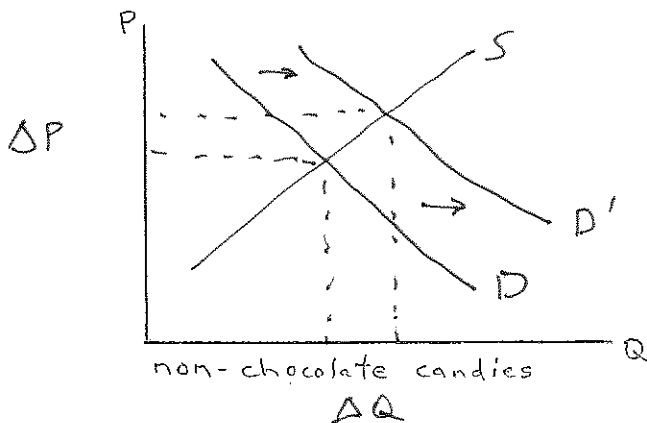
Increase in price of a substitute increases the demand for non-chocolate candies. Buy Perfetti stock!

2. "Cocoa prices for September delivery on the ICE Futures U.S. exchange settled at $3,260 a metric ton on Friday, up 12% in 2015." (*WSJ* 6/20/15). World output of cocoa has declined from 4.36 million metric tons to 4.23 million metric tons between 2014 and 2015.

(a) (10 pts.) Calculate own-price elasticity of demand for cocoa.

$$\mathcal{E}_{x, P_x} = - \frac{\% \, \Delta Q}{\% \, \Delta P}$$

$$= \frac{\dfrac{4.36 - 4.23}{\frac{1}{2}(4.36 + 4.23)}}{12\%}$$

$$= \frac{3\%}{12\%} = 0.25$$

Demand is inelastic.

(b) (5 pts.) Knowing what you do about factors affecting own-price elasticity of demand, can you think of any reasons why you got a number like you did?

Cocoa is a necessary input in the production of chocolate candy — no substitutes are readily available! To the extent that consumers are addicted to chocolate, demand for a necessary input like cocoa will be inelastic.

3. We own and operate a Johnny Jim's sandwich shop. After some experimentation with our current configuration of the restaurant, we find that labor and output vary in the following way:
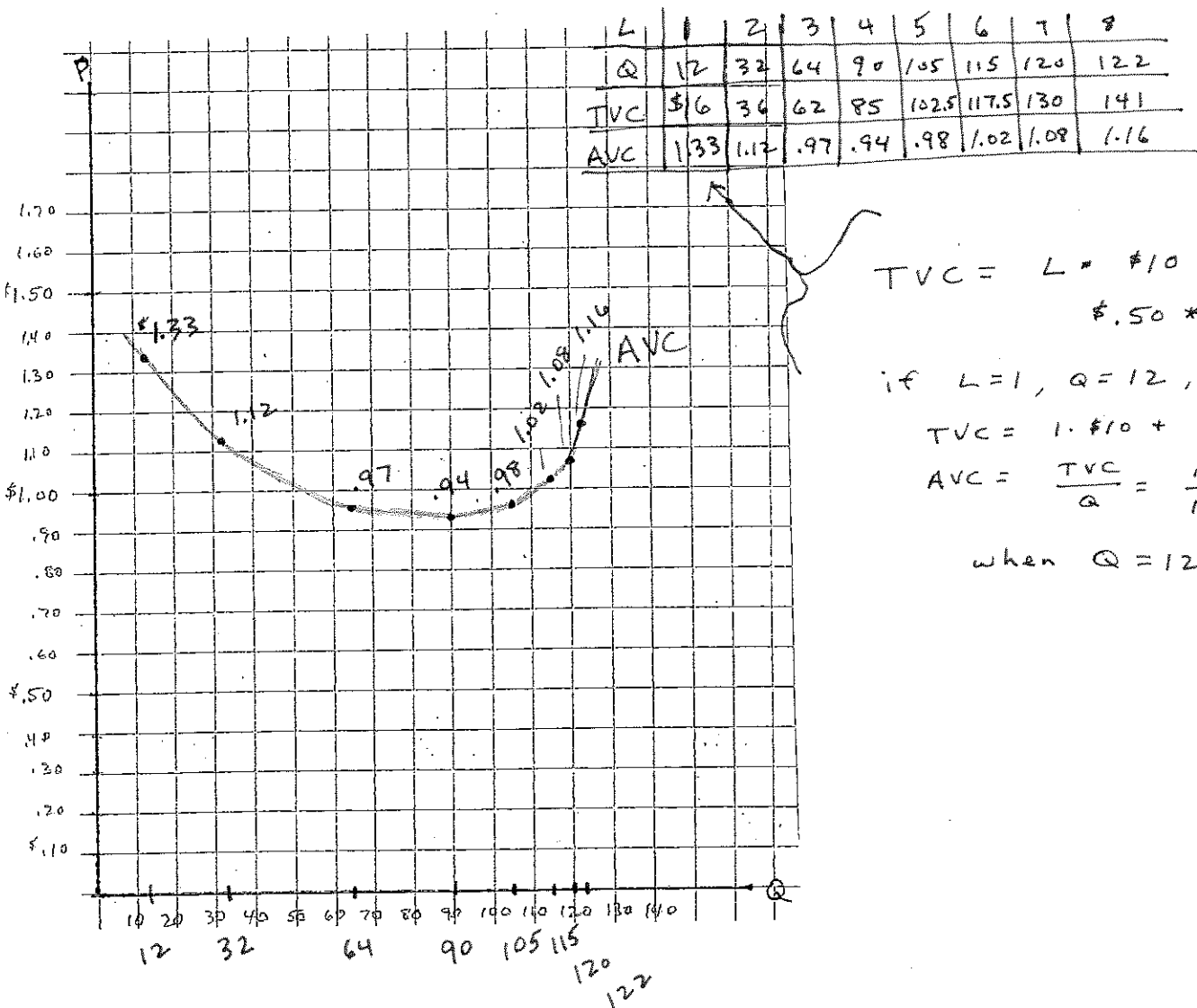
Labor (person-hours)	0	1	2	3	4	5	6	7	8
Output (meals per hour)	0	12	32	64	90	105	115	120	122

(a) (5 pts.) Use the concept of marginal product to explain at what point diminishing returns set in.

$$MP_L = \frac{\Delta Q}{\Delta L} = \quad 12 \quad 20 \quad 32 \quad 26 \quad 15 \quad 10 \quad 5 \quad 2$$

Diminishing marginal returns set in with the addition of a fourth worker

(b) (10 pts.) Total compensation costs (wages plus benefits) per worker are $10 per hour. The only other variable costs besides labor are the sandwich ingredients, which cost a constant $.50 per sandwich. Plot eight points on our firm's average variable cost curve.

L	1	2	3	4	5	6	7	8
Q	12	32	64	90	105	115	120	122
TVC	$16	36	62	85	102.5	117.5	130	141
AVC	1.33	1.12	.97	.94	.98	1.02	1.08	1.16

$$TVC = L * \$10 + \$.50 * Q$$

if $L=1$, $Q=12$, and

$$TVC = 1 \cdot \$10 + .5 * 12 = \$16$$

$$AVC = \frac{TVC}{Q} = \frac{16}{12} = \$1.33$$

when $Q = 12$

4. While working on his MBA, Wayne was inspired to start his own business after graduation. He decided to open a food truck, and serve food to the downtown lunch crowd, to after-work beer drinkers at local craft brew-pubs, to baseball and soccer families at parks on weekends, and wherever else he was able to find hungry people. Based upon expertise gained while a graduate student, he chose roast beef sandwiches and curly fries as featured items on his menu.

(a) (5 pts.) After operating this business for several years, Wayne decides to move back to his hometown of Cincinnati and become an Arby's franchisee. He offers to sell his business to you. He opens his publicly audited books to you and you see $300,000 in revenues each year from food sales. You also see $40,000 in labor costs for hourly workers who help him run the business, $120,000 in wholesale food costs, $10,000 for gas and maintenance on the truck, $20,000 for insurance, taxes, and business license fees, and $15,000 for advertising and web site expenses. What are Wayne's accounting profits?

Explicit Costs

wage labor	40,000
food - wholesale	120,000
gas & maintenance	10,000
ins., taxes, fees	20,000
advertising	15,000
	$205,000

TR - T. Explicit Costs = acc'ting Π

300,000 - 205,000 = $95,000

(b) (15 pts.) Wayne invites you to work alongside him in the business for a while to help you decide whether to buy it. You learn the following things. Wayne works full time in his food truck but takes his compensation in the form of profits instead of paying himself a salary. Wayne owns his truck outright. Fully outfitted food trucks like his cost $75,000 when new, and have an expected life of five years, at which point they are worth nothing. Wayne's truck is on its last legs, so if you buy the business you will need to buy a new truck. You know that MBA's like you have been getting job offers in the $65,000 annual salary range. You have some money invested in indexed mutual funds where they earn 5%. You could also borrow money to buy a truck from any bank in town at 5%. What do you think of this business opportunity? Answer by calculating the economic profits (or losses) if you were to own and operate this food truck. Carefully explain how you arrive at your answer.

Total Revenue = $300,000

Total Explicit Costs = $205,000

Implicit Costs:

① opportunity cost of your time ≈ $65,000

② depreciation on your food truck
$75,000 over 5 years ≈ $15,000 per year

③ interest earnings foregone
if you borrow from yourself
or direct interest payments if ≈ $3,750 per year
you borrow from a bank
(5% * $75,000)

Total Implicit Costs = $83,750

Economic Profit = 300,000 - 205,000 - 83,750

= $11,250

It is a good opportunity!

5. (15 pts.) A firm produces two products, X and Y. The production technology displays the following costs, where C(i, j) represents the cost of producing i units of X and j units of Y:

C(0,50) = 220   C(5,0) = 125
C(0,100) = 420   C(10,0) = 260
C(5,50) = 350   C(10,100) = 700

Does this production technology display economies of scale in the production of good X? Does it display economies of scale in the production of good Y? Does it display economies of scope? In explaining your answers tell me whether you expect to see small or big firms producing good X. Do you expect to see small or big firms producing good Y? Do you expect to see firms specializing in either good X or good Y or firms producing both goods simultaneously?

good X: c (5,0) = 125 ,   c (10,0) = 260
       per unit costs increase as output increases,
       so diseconomies of scale.

good Y: c (0,50) = 220 ,   c (0,100) = 420
       per unit costs decrease as output increases,
       so economies of scale.

goods X and Y: economies of scope?

       c (5,50) $\gtreqless$ (?) c(5,0) + c (0,50) ?

       350   >   125 + 220   (= 345)

       so diseconomies of scope

We would expect to see smaller firms producing good X, larger firms producing good Y, and firms specializing in either good X or good Y.

6. (5 pts.) Family Dollar's stock price was $28 on 1/1/10. By 1/1/14 it had risen to $65. Dollar General's stock price was $23 on 1/1/10. By 1/1/14 it had risen to $60. Using concepts you have learned in this class, briefly explain why.

Family Dollar and Dollar General tend to sell lower quality products at lower prices, many of which have a negative income elasticity or are inferior goods. As the economy went into a recession and household incomes fell, business picked up considerably for Family Dollar and Dollar General.

7. (5 pts.) Amazon is in the process of robotizing its distribution centers. The Lexington Amazon distribution center currently does not have any Kiva robots in use, but the facility is likely to be converted in the near future. Write an algebraic expression that characterizes the efficiency or inefficiency of the current mix of capital and labor at the Lexington distribution center, and briefly explain the logic of your algebra.
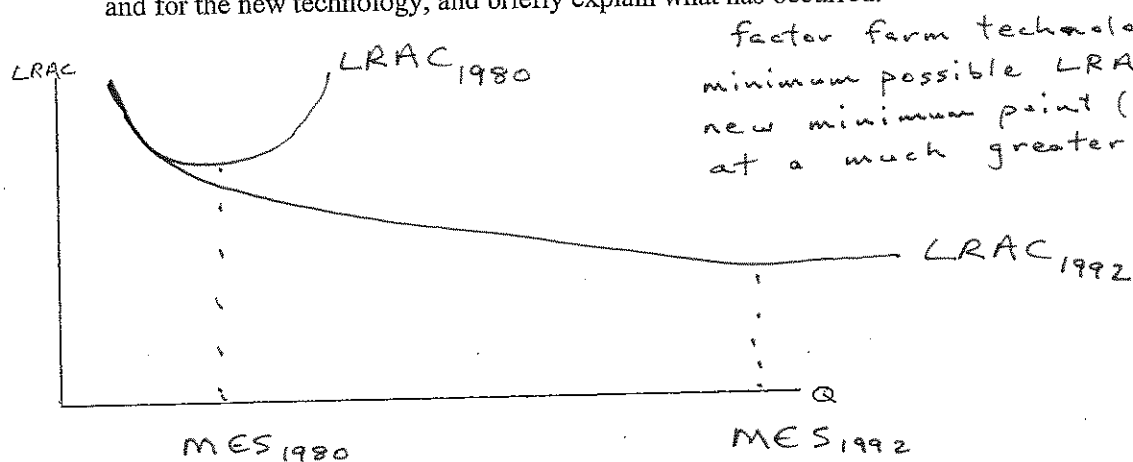
Efficient combination of L and K:

$$\frac{MP_L}{w} = \frac{MP_K}{r}$$

If Amazon is in the process of substituting capital for labor in their distribution centers, then they must think that $\frac{MP_K}{r} > \frac{MP_L}{w}$ for their current input mix. In other words, another dollar spent on capital yields a greater increase in output than another dollar spent on labor.

8. (5 pts.) Pork production in the U.S. previously was centered on family farms located in Iowa. A revolution in technology has caused that to change such that most pork is produced on factory farms located in states like North Carolina and Kentucky. Sketch LRAC's for the old technology and for the new technology, and briefly explain what has occurred.

factory farm technology reduces minimum possible LRAC, but this new minimum point (MES) occurs at a much greater scale of operation.

9. (5 pts.) Evaluate the logic of this statement: Firms should make, rather than buy, to avoid paying a profit margin to independent firms, i.e. "our firm should backward integrate to capture the profit of our suppliers for ourselves."

Our suppliers are likely making positive accounting profits, but that does not mean that they are making positive economic profits. If they are not making positive economic profits, then there is no above-normal return to be gained by vertically integrating. The "profits" that our suppliers are making are just a normal return on their investment and effort.