McPeak
PAI 897
Exam 2 Fall 2016

Name: Key

15 Total Points. Each numbered questions is worth 1.5 points, sub questions worth an equal share of these 1.5 points.

1) Complete the following table.

Output	Fixed Cost	Total Cost	Variable Cost	Marginal Cost	Average Cost	Average Variable Cost
0	6	6	0	NA	NA	NA
1	6	21	15	15	21	15
2	6	35	29	14	17½	14½
3	6	48	42	13	16	14
4	6	63	57	15	15¾	14¼
5	6	80	74	17	16	14.8
6	6	98	92	18	16⅓	15⅓
7	6	119	113	21	17	16.14
8	6	144	138	25	18	17¼

a) Is this a short run or long run information on cost? Why?

short run since there is Fixed cost

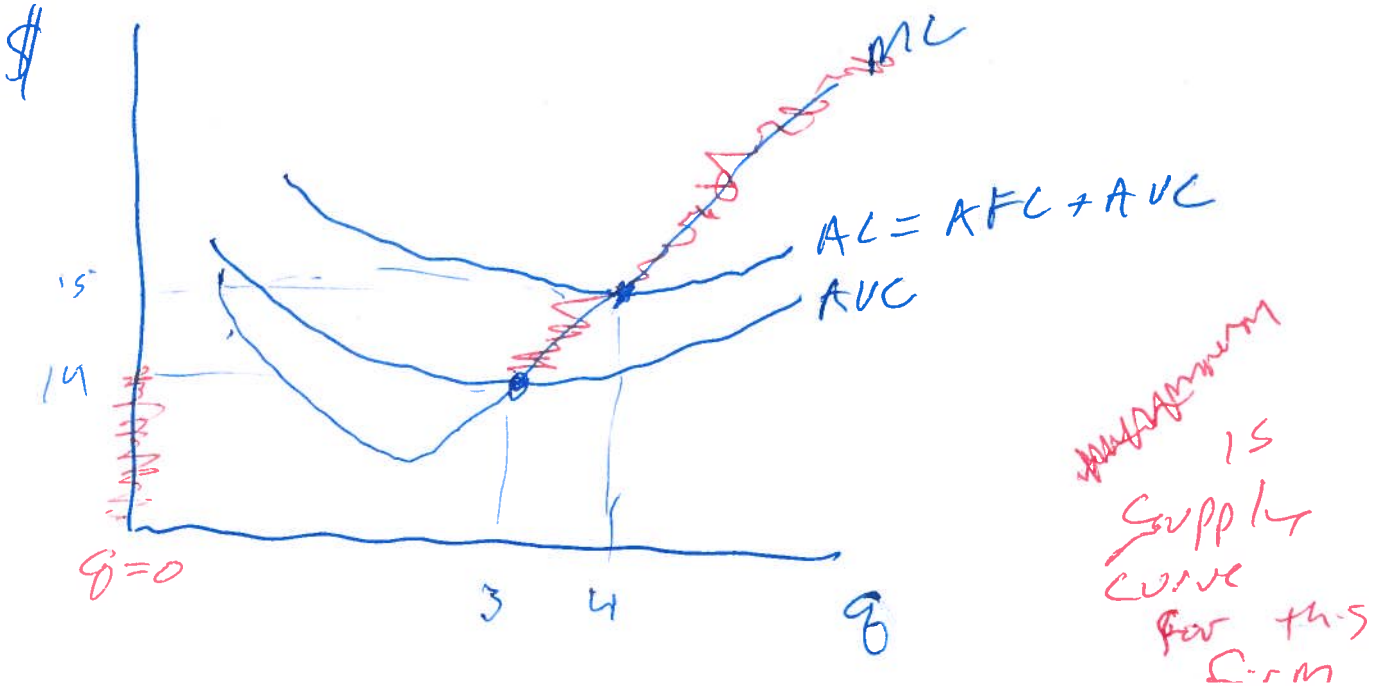
b) If the price of the good produced is currently 18, what level of output meets the profit maximizing condition?

1) $P = 18 = MC$ @ $q = 6$

2) at $q = 6$, $P = 18 > AVC(q=6) = 15\frac{1}{3}$

or $18 \cdot 6 - 98 = 108 - 98 = 10$ so $\Pi(q=6) > FC = -6$

c) Illustrate how to derive the firm's supply curve using the relevant cost curves in this table.



2) Public goods and voting.

The city of Syracuse is considering investing in improvements to Thornden Park just east of the SU campus. There are three proposals put forward for the five remaining (!!) families living in Syracuse to vote on:

Proposal A: Aerial Treetop Adventure Zone with zip lines, obstacles, and cables in the trees to encourage outdoor climbing adventures. Total cost is $15,000 ($3000 each).

Proposal B: Bungee jumping zone off the Stewart Standpipe / Water Tower. Total cost is $10,000 ($2,000 each).

Proposal C: Yoga in the park Amphitheater with special appearances of the Syracuse City Ballet and the Open Hand Theater puppets. Total cost is $5,000 ($1,000 each).

This table records each household's WTP for each proposal.

Household Name	Proposal A – $3000 each	Proposal B – $2000 each	Proposal C - $1000 each
Westmoreland	$1,000	$1,800	$900
Lennox	$5,000	$7,500	$100
Cumberland	$3,000	$1,800	$950
Livingston	$1,600	$1,900	$2,000
Allen	$3,200	$1,750	$2,500

a) Each household gets to vote yes or no for each proposal. How will they vote? (circle)

Household Name	Proposal A		Proposal B		Proposal C	
Westmoreland	Yes	No	Yes	No	Yes	No
Lennox	Yes	No	Yes	No	Yes	No
Cumberland	Yes	No	Yes	No	Yes	No
Livingston	Yes	No	Yes	No	Yes	No
Allen	Yes	No	Yes	No	Yes	No

Pass not Pass not Pass

b) What is the sum of the WTP minus the costs for each proposal?

Proposal A	Proposal B	Proposal C
13,800 − 15,000 = $ −1,200	14,750 − 10,000 = $ 4,750	6450 − 5000 = $ 1450

c) Did voting lead us to select the proposal that has the highest sum of WTP minus costs? Explain why or why not.

No. It did not. yes-no voting ignores intensity of preferences. Median voter theorem /

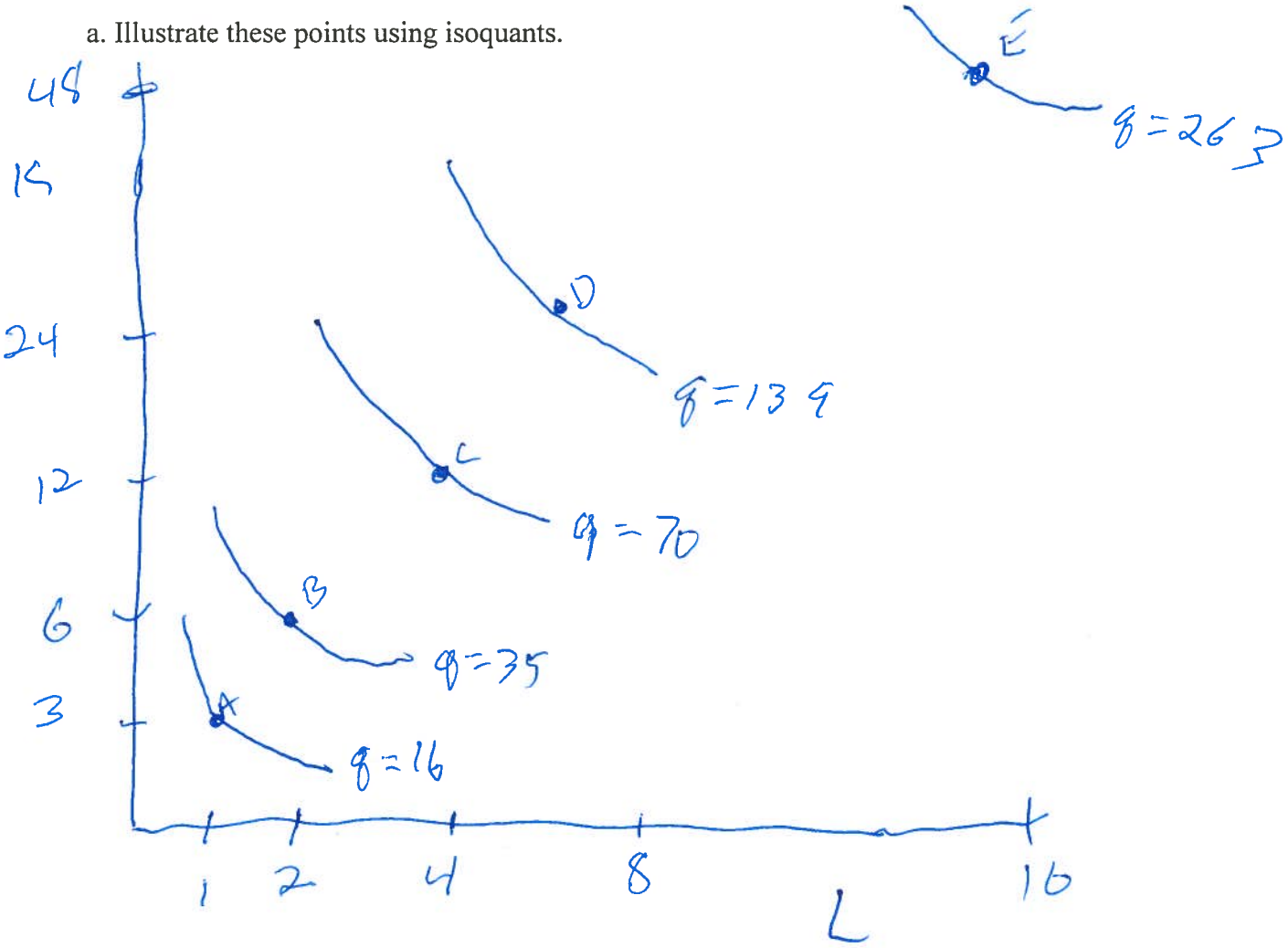
3) Circle the correct answer.

Statement	**The statement is (circle the correct answer)**	
Societal WTP for a public good is derived by horizontal summation of each individual's quantity demanded at a given price.	True	False
An isoquant traces out all combinations of inputs that generate a given level of output in a technologically efficient way.	True	False
In a perfectly competitive market all units of the good q are homogeneous.	True	False
If where price = MC(q), price is less than average variable cost, the firm should shut down and produce q=0 in the short run.	True	False
Marginal cost = cost of the input / marginal product.	True	False
The slope of the isocost line is the marginal rate of technical substitution.	True	False
According to the last dollar rule, the marginal products of capital and labor should be equal at the economically efficient point	True	False
The expansion path traces out input bundles that are defined as the maximum cost ways of producing given levels of output.	True	False

4) You are given the following information on the relationship between inputs and production level at various points.

Points	Labor	Capital	Output
A	1	3	16
B	2	6	35
C	4	12	70
D	8	24	139
E	16	48	263

a. Illustrate these points using isoquants.



b. Contrast the returns to scale implied by movement between the points. (circle the correct answer)

From A to B I have (increasing, constant, decreasing) returns to scale.
From B to C I have (increasing, constant, decreasing) returns to scale.
From C to D I have (increasing, constant, decreasing) returns to scale.
From D to E I have (increasing, constant, decreasing) returns to scale.

5) Market structure and externalities. The inverse demand curve is given as p=120-2q. The supply curve is p=20+3q.

a. What is the equilibrium price quantity pair if the market structure is perfectly competitive?

$120-2q = 20+3q$

$100 = 5q$

$q = 20$

$120-2(20) = P$ or $20+3(20) = P$

$80 = P$ $\quad 80 = P$

$(P^*, q^*) = (\$80, 20)$

b. If there is a marginal externality generated by production of the good equal to 5*q (MC^E=5*q), what is the socially optimal price quantity pair?

$120-2q = 20+3q+5q$

$120-2q = 20+8q$

$-20 \quad +2q \quad -20 \quad +2q$

$100 = 10q$

$q = 10$

$120-2(10)$ | $20+8(10)$

$= 100$ | $= 100$

$(P^{SO}, q^{SO}) = (\$100, 10)$

c. What size specific tax τ placed on producers can be used to replicate the socially optimal outcome?

$\tau = MC^E(q^{SO}) = 5(10) = \$50$

or

~~$20+3q+10q$~~

$20+3q^{SO}+\tau = P^{SO}$

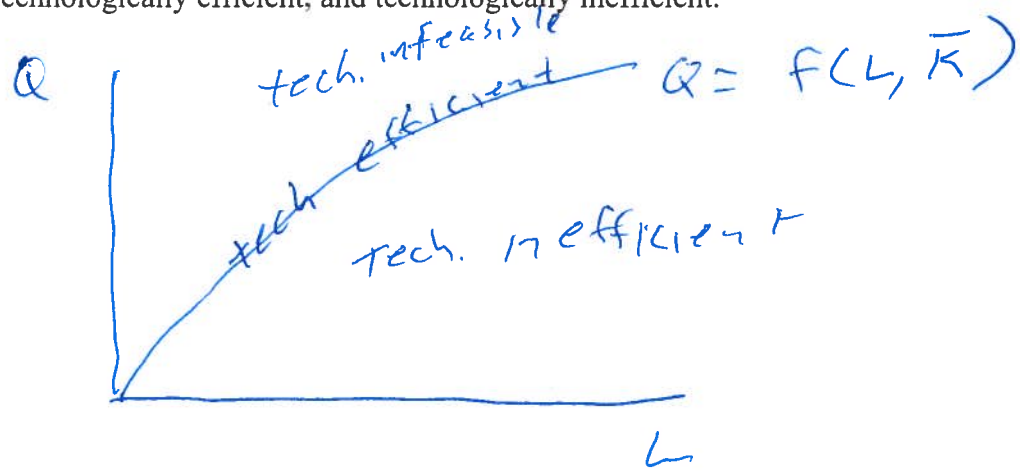
$20+3(10)+\tau = 100$

$50+\tau = 100$

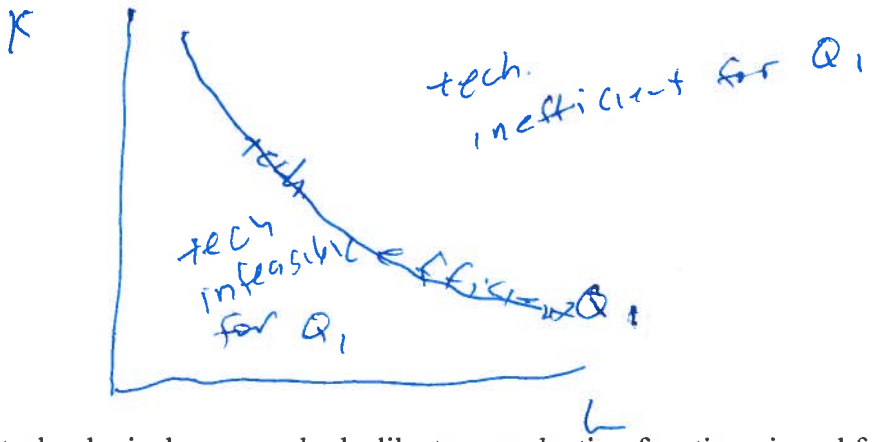
$\tau = \$50$

6) Production.

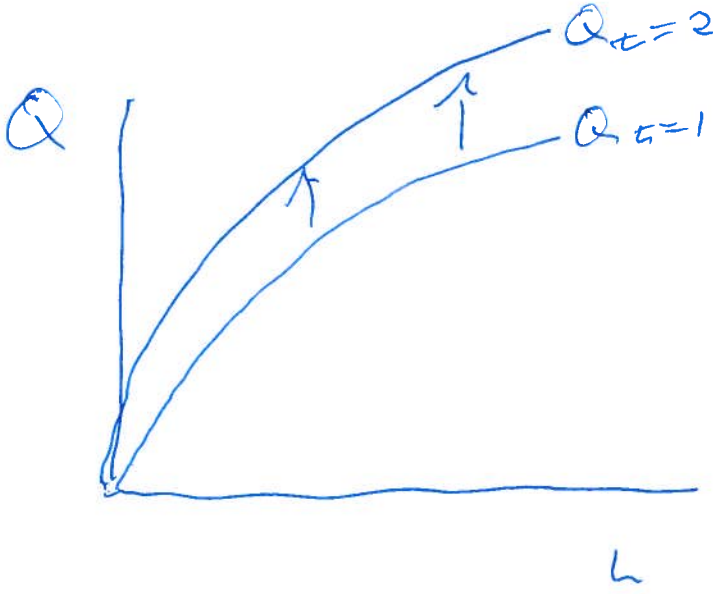
a) $Q=f(L, \bar{K})$ is the production function with L as labor and K as a fixed level of capital. Draw this production function from the side view and illustrate areas that are: technologically infeasible, technologically efficient, and technologically inefficient.



b) $Q=f(L,K)$ is the production function with both labor and capital variable. Draw an isoquant for the quantity Q_1 and illustrate areas that are: technologically infeasible for producing Q_1, technologically efficient for producing Q_1, and technologically inefficient for producing Q_1.



c) Illustrate what technological progress looks like to a production function viewed from the side, like you drew for (a).



7) Avner Grief is an economist who studies the rise of medieval trade in the Mediterranean basin. He describes the following situation:
   - A ruler of a city state can offer security to a visiting merchant. The ruler can protect the merchant from being robbed by the citizens of the city state at a cost of 1.
   - The merchant has goods that cost him 1 to obtain elsewhere and transport to the city state if he decides to come. If they are sold in the city state, they earn revenue of 6, thus generating a profit of 5.
   - The deal is that if the merchant comes with goods that generate a profit of 5 the ruler gets 2, the merchant keeps 3. The ruler thus nets 1 after paying the security cost [1 3 cell in the table]
   - If the merchant does not come, no security costs are incurred; no goods are bought elsewhere to be sold in the city state, the ruler and the merchant get zero. [0 0 cell in the table]
   - If the merchant comes and the ruler does not provide security, the ruler and his mob of citizens rob the stuff and sell it for profit of 6. The ruler keeps half (3), the mob keeps half (3). The merchant suffers a loss of -1. [3 -1 cell in the table]
   - If the ruler pays for protection but the merchant does not come, the ruler pays the cost of protection, but gets no benefits, so suffers a loss of -1. [-1 0 cell in the table]

This can be summarized in the following table.

		Merchant	
		Come	Don't Come
Ruler	Protect	1, 3	-1, 0
	Don't protect	3, -1	0, 0

a) Describe the best response strategies in this game and identify the Nash equilibrium outcome.

If R protects, M comes.
If R does not protect, R does not come
If M comes, R does not protect
If M does not come, R does not come
Nash equilibrium is Don't protect, don't come, R = 0, M = 0

b) Describe the outcome in terms of Pareto Optimality and note if a potentially Pareto improving outcome exists.

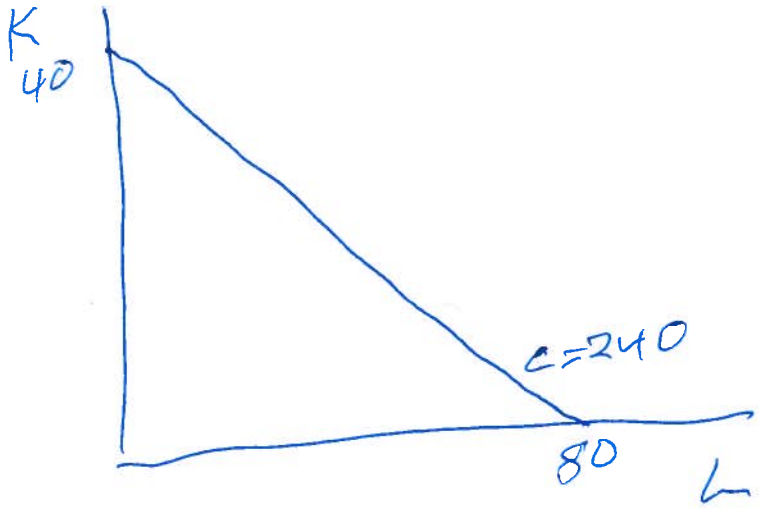
The Nash equilibrium outcome is not Pareto Optimal. There is a Pareto optimal outcome at Merchant comes and Ruler protects with R=1, M=3 that Pareto improves on the Nash outcome as it makes at least one (here both) better off without making anyone worse off.

8) Assume the rental rate of capital is 6 and the wage rate is 3.

a. Draw an isocost curve for a total cost level of 240.

$r = 6, w = 3$

$C = 6 \cdot K + 3 \cdot L$



b. If the marginal physical product of labor is 2, what is the marginal physical product of capital at an economically efficient point? Why?

$MP_L = 2$

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

$$\frac{2}{3} = \frac{MP_K}{6} \qquad 12 = 3 \cdot MP_K$$

$$4 = MP_K$$

Check: $\frac{2}{3} = \frac{4}{6}$

c. What is the formula for and value of the Marginal Rate of Technical Substitution for the point you described in part b?

$$MRTS = \frac{-MP_L}{MP_K} = -\frac{2}{4} = -\frac{1}{2}$$

9) Public goods. The Christmas Tree is already up in Clinton Square and will be lit for the first time on November 25th. There are three people in town. Each has a demand curve for the number of strings of lights to put on the Christmas tree in Clinton Square (q is the # of strings of light here). Stephanie's demand is \$5.00-\$0.10*q. Van's demand is \$3.20-\$0.20*q. Helen's is \$3.00-\$0.10*q.

a. If the marginal cost of a string of lights is constant at \$4.00 per string of lights and no effort is made to avoid the free rider problem, what number of strings of lights will be provided and who will provide it?

S: $5.00 - .10q$, WTP = 0 at $q = 50$

V: $3.20 - .20q$, WTP = 0 at $q = 16$

H: $3.00 - .10q$, WTP = $q = 30$

S: $5.00 - .10q = 4.00$

$1.00 = .10q$

Stephanie will provide 10 and Van and Helen will free ride.

Warning

$11.20 - .40q = 4$ will give you the wrong answer of $q = 18$ as Van's WTP @ 1y = -0.40

b. How much less is this than the socially optimal number of strings of lights if the cost is \$4.00 per string of lights?

$(5 + 3.2 + 3) - (.10q + .20q + .10q)$

$11.20 - 0.40q$ $q = 0$ to $q = 16$

$(5 + 3) - (.10q + .10q)$

$8 - .20q$ $q = 16$ to $q = 30$

$5 - .10q$ $q = 30$ to $q = 50$

at $q = 16$, $11.20 - .40q = \$4.80$

$8.00 - .20q = \$4.80$

so solve $8 - .20q^{50} = \$4.00$

$4 = .20q^{50}$

$q^{50} = 20$

Warning

$11.20 - .40q = 4$ gives the wrong answer of $q = 18$ as it

10) Cost

a. Complete the following table.

Quantity of Output	Total Cost	Average Cost	Marginal Cost
0	0	----------	---------
1	2	2	2
2	3	3/2 = 1.5	1
3	6	2	3
4	10	10/4 = 2.5	4
5	16	16/5 = 3.2	6
6	24	4	8
7	35	5	11
8	48	6	13

b. If the market price for the output produced is 3 and the market structure is perfectly competitive, what level of output is the profit maximizing level of output? Why?

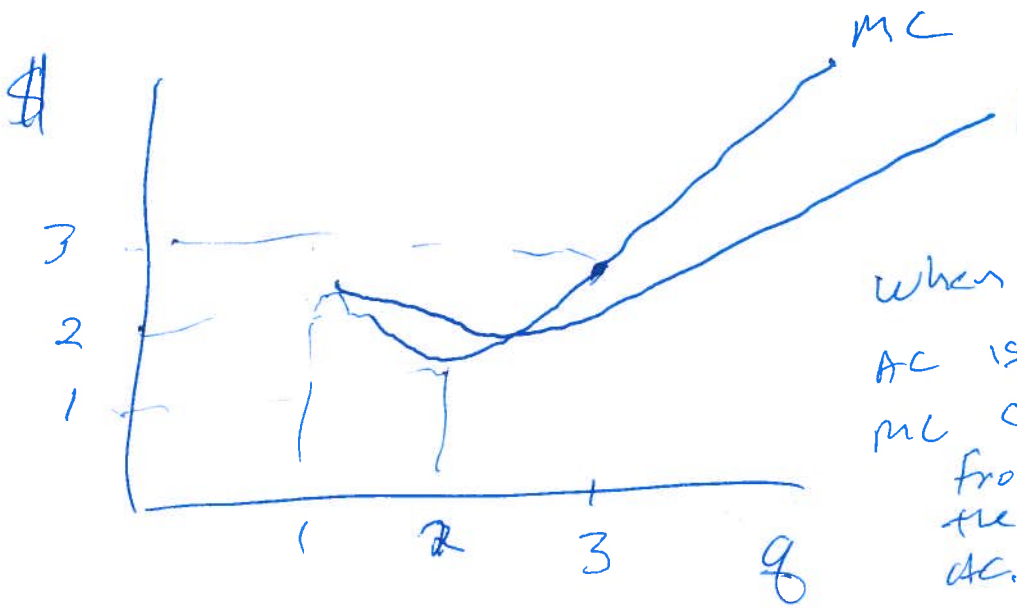
1) $P = 3$ $MC = 3$ when $q = 3$

2) at $q = 3$ $AC = 2$ so $P > AC$

or

$\pi(q=3) = 3 \cdot 3 - 6 = 9 - 6 = 3$

c. Illustrate on a graph the average cost and marginal cost curves. Describe how the shapes of these two curves are related to each other.



when MC < AC AC is declining. MC crosses AC from below at the minimum of AC. when MC > AC AC is increasing