

### FINAL EXAMINATION VERSION A

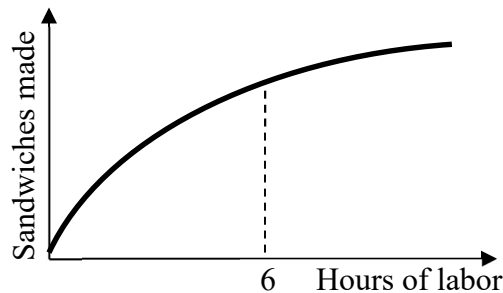
INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators, calculators with alphabetical keyboards, cell phones, and wireless devices are NOT permitted. Point values for each question are noted in brackets. Maximum total points are 200.

**I. Multiple choice:** Please circle the one best answer to each question. [1 pt each, 30 pts total]

- (1) When we assume that people do the best they can with what they have, we are assuming that people are
- “competitive.”
  - “positive.”
  - “rational.”
  - “in equilibrium.”

- (2) Rational choice implies eating donuts until the marginal cost of the last donut
- is much greater than its marginal benefit.
  - begins to exceed its marginal benefit.
  - begins to fall below its marginal benefit.
  - is much less than its marginal benefit.

- (3) Is the production function below characterized by diminishing returns to labor input?
- Yes, for all levels of labor input.
  - No, not for any levels of labor input.
  - Yes, but only after 6 hours of labor input.
  - Yes, but only before 6 hours of labor input.

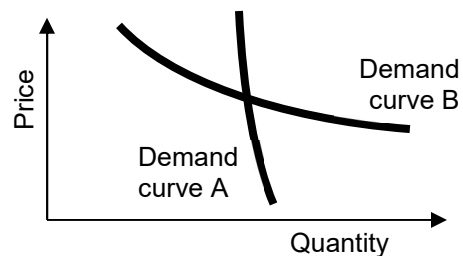


- (4) A decrease in the price of oranges will
- shift the demand curve for oranges to the right.
  - shift the demand curve for oranges to the left.
  - move buyers along the demand curve for oranges down and to the right.
  - rotate the demand curve for oranges so that it becomes steeper.
  - rotate the demand curve for oranges so that it becomes flatter.

- (5) A rise in the price of ice cream will shift the demand for frozen yogurt to the right, assuming ice cream and frozen yogurt are
- complementary goods.
  - substitute goods.
  - normal goods.
  - inferior goods.

- (6) In August, the price of swimsuits decreases and the quantity sold decreases. This could be caused by
- rightward shift in the demand.
  - rightward shift in the supply.
  - leftward shift in the demand.
  - leftward shift in the supply.

- (7) Which demand curve below is *more* elastic?
- Demand curve A.
  - Demand curve B.
  - Both have the same elasticity because they pass through the same point.
  - Cannot be determined from information given.



The next three questions refer to the following demand and supply schedules for corn in two countries.

Price	Country X		Country Y	
	Q <sub>D</sub>	Q <sub>S</sub>	Q <sub>D</sub>	Q <sub>S</sub>
\$1	60	30	60	10
\$2	50	50	55	15
\$3	40	70	50	20
\$4	30	90	45	25
\$5	20	110	40	30
\$6	10	130	35	35
\$7	0	150	30	40

(8) In the absence of international trade, Country X's equilibrium price of corn would be

- \$2.
- \$3.
- \$4.
- \$5.
- \$6.

(9) With international trade, the equilibrium price of corn in both countries would be

- \$2.
- \$3.
- \$4.
- \$5.
- \$6.

(10) Who in Country X benefits from international trade in corn?

- Buyers in Country X.
- Sellers in Country X.
- Both buyers and sellers in Country X.
- Neither buyers nor sellers in Country X.

(11) Suppose the price of a pumpkin in Des Moines is \$7 and the cost of shipping a pumpkin between Des Moines and Omaha is \$3. Markets are *out of equilibrium* if the price of pumpkins in Omaha is

- \$2.
- \$5.
- \$6.
- \$9.

(12) Suppose the price elasticity of demand for baby food is -0.2 and the price elasticity of supply is 5.0.

If a subsidy is given for baby food,

- producers will enjoy most of the subsidy.
- consumers will enjoy most of the subsidy.
- producers and consumers will each enjoy half of the subsidy.
- Answer depends on which side receives the check from the government.

(13) Production of lithium batteries is increasing. An increase in the number of companies who produce lithium batteries is called a change at the

- extensive margin.
- intensive margin.
- marginal product.
- marginal revenue.

(14) The increase in a firm's total revenue from producing and selling one more unit of output by definition equals the firm's

- total cost.
- average cost.
- marginal cost.
- total revenue.
- average revenue.
- marginal revenue.

(15) The slope of the firm's total cost curve by definition equals the firm's

- total revenue.
- average revenue.
- marginal revenue.
- total cost.
- average cost.
- marginal cost.

(16) A small firm in a big market maximizes its profit by

- shifting its marginal cost curve up or down so that price equals marginal cost at its desired output level.
- adjusting its price so that price equals marginal cost.
- adjusting its output quantity so that price equals marginal cost.
- all of the above.

(17) The formula for discounting shows that the present discounted value of \$100 to be received in the future is *greater*,

- a. the lower the interest rate (or discount rate).
- b. the higher the interest rate.
- c. Present discounted value is not affected by the interest rate.
- d. Cannot be determined from the information given.

(18) *Price equals marginal cost* in a competitive industry in both short-run and long-run equilibrium because

- a. business owners have a sense of fairness.
- b. individual firms adjust their output levels to maximize profit.
- c. consumers refuse to pay more than what is reasonable.
- d. positive profits encourage entry of new firms while negative profits encourage existing firms to leave the industry.
- e. the threat of government regulation causes firms to hold prices down.

(19) In a perfectly competitive market, buyers view the outputs of different firms as

- a. perfect complements.
- b. perfect substitutes.
- c. perfect squares.
- d. differentiated products.

(20) Suppose the price of a calculator is \$6 and the price of a flashdrive is \$3. If the economy is perfectly competitive, then these prices indicate that the *economy's* opportunity cost of a calculator is

- a. 1/2 of a flashdrive.
- b. 1/3 of a flashdrive.
- c. 1 flashdrive.
- d. 2 flashdrives.
- e. 3 flashdrives.

(21) A perfectly competitive firm expects that if it increases its output, this will cause the price to

- a. increase.
- b. decrease.
- c. stay the same.
- d. cannot be determined from information given.

(22) If a profit-maximizing firm faces a downward sloping demand curve for its product, it will set a price

- a. less than marginal cost.
- b. equal to marginal cost.
- c. greater than marginal cost.
- d. less than or greater than marginal cost, depending on the elasticity of demand.

(23) Economists are opposed to monopolies because monopolies

- a. create unhealthy concentration of social power.
- b. set prices that exclude some buyers who are willing to pay the marginal cost.
- c. make the rich richer, and the poor poorer.
- d. make people buy things that people don't really want.
- e. advertise too much.
- f. All of the above.

(24) If the products of different firms are "differentiated," then each firm

- a. faces horizontal (perfectly elastic) demand.
- b. takes price as given.
- c. faces upward-sloping demand.
- d. faces downward-sloping demand.

(25) In the 1800s and early 1900s, whales were not protected. Anyone could kill them without paying or asking for permission. Unfortunately, many species were nearly wiped out—hunting by one person left fewer whales for others. Therefore whales were

- a. a nonrival good.
- b. a nonexcludable good.
- c. both of the above.
- d. none of the above.

(26) If one person downloads a particular electronic book, the same e-book can be downloaded by other people. However, everyone who downloads the e-book is forced to pay for it. This e-book is therefore

- a. a nonrival good.
- b. a nonexcludable good.
- c. both of the above.
- d. none of the above.

(27) Wind can be harnessed for a variety of purposes, such as generating electricity. But one person using the wind does not leave less for others, and no one can be forced to pay for it. Wind is therefore

- a. a nonrival good.
- b. a nonexcludable good.
- c. both of the above.
- d. none of the above.

(28) Suppose a factory creates a loud, unpleasant noise from its production activities that can be heard by neighbors up to a half-mile away. The factory's noise thus creates

- a. an external benefit.
- b. an external cost.
- c. a common property resource.
- d. an inferior good.

(29) Certain flowers attract butterflies. If my neighbor buys and plants these flowers, I will enjoy butterflies in my yard, too. By planting these flowers, my neighbor is creating

- a. an external benefit.
- b. an external cost.
- c. a complement.
- d. a superior good.

(30) Economists believe that environmental problems are caused, for the most part, by

- a. lack of awareness.
- b. moral failing.
- c. misaligned incentives.
- d. market power.

---

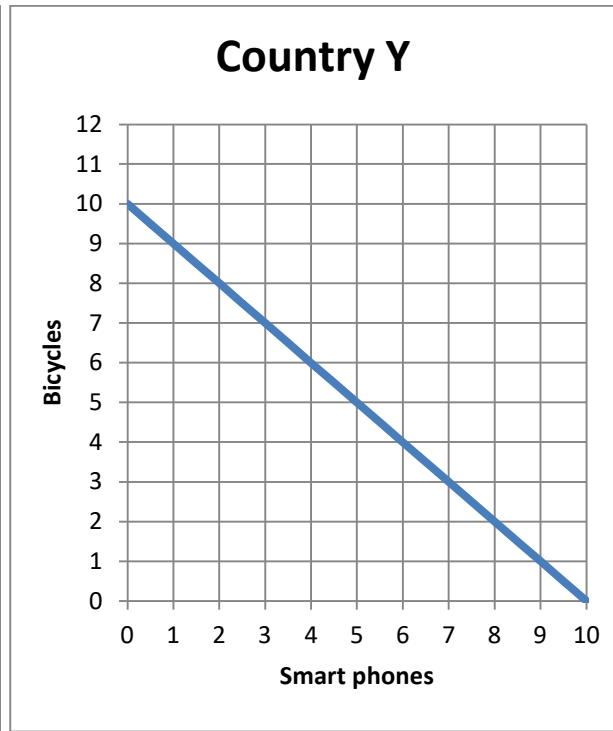
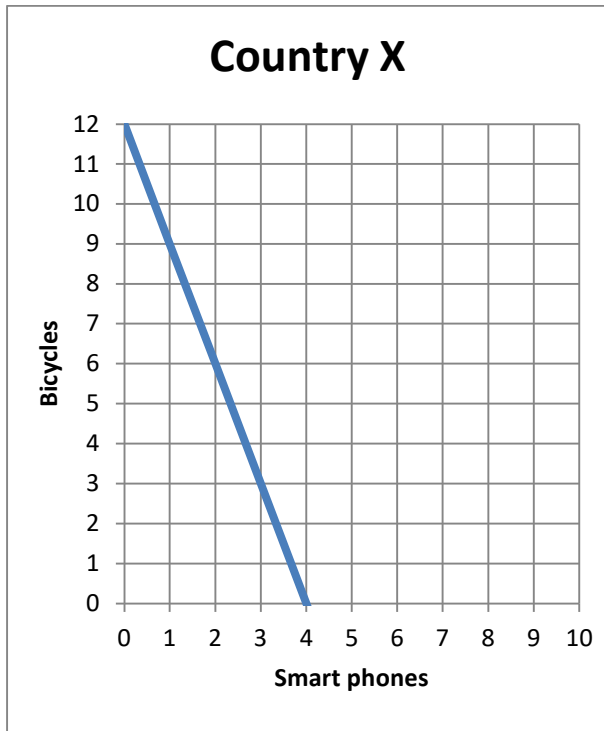
**II. Problems:** Insert your answer to each question in the box provided. Use margins and graphs for scratch work. Only the answers in the boxes will be graded. Work carefully—partial credit is not normally given for questions in this section.

(1) [Using price elasticity of demand: 10 pts] Suppose the water utility *raises* its price by 5%. Suppose the price elasticity of demand for water is -0.4. Assume everything else affecting demand for water remains constant.

- a. According to the information above, is demand for water *elastic*, *inelastic*, or *unitary-elastic*?
- b. As the price rises, will the amount of water consumed *increase*, *decrease*, or remain *constant*?
- c. ... by approximately how much?
- d. Will the total revenue received by the water utility *increase*, *decrease*, or remain *constant*?
- e. ... by approximately how much?

%
%

(2) [Comparative advantage, gains from trade: 17 pts] Country X and Country Y can each produce bicycles and smart phones. They each face a tradeoff between these two products because of limited workforces. Their production possibility curves are shown below.



- What is Country X's opportunity cost of producing a smart phone?
- What is Country Y's opportunity cost of producing a smart phone?
- What is Country X's opportunity cost of producing a bicycle?
- What is Country Y's opportunity cost of producing a bicycle?
- Which country has a comparative advantage in producing smart phones?
- Which country has a comparative advantage in producing bicycles?

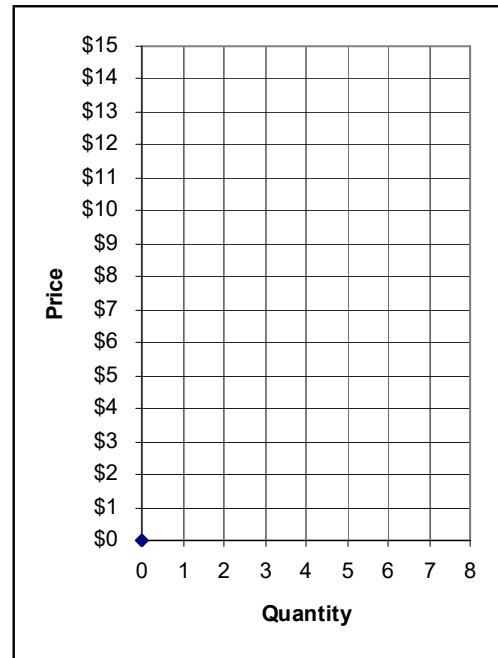
	bicycles
	bicycles
	smart phones
	smart phones

g. [3 pts] Fill in the blanks: *Both* countries can consume combinations of products *outside* their individual production possibility curves if \_\_\_\_\_ exports *three* bicycles to \_\_\_\_\_, which exports \_\_\_\_\_ smart phones in return.

h. **Plot** the trade that you propose in part (g) on the graphs above. For each country, plot and label the starting point representing **production before trade**, and the ending point representing **consumption after trade**.

(6) [Market equilibrium: 12 pts] Suppose seven buyers and seven sellers engage in a market similar to the exercise we did in class. Each buyer may buy at most one unit and each seller may sell at most one unit, but no one is forced to trade. Assume that buyers and sellers are each trying to maximize their personal surplus (or “gains from trade”). Surplus for each buyer equals the buyer's value of the good minus the price paid. Surplus for each seller equals the price received minus the seller's cost of the good. Surplus of persons who do not trade are zero. Buyers' values and sellers' costs are given in the following table.

Buyer	Value	Seller	Cost
Bob	\$12	Sue	\$ 1
Barb	\$12	Steve	\$ 1
Ben	\$12	Sam	\$ 1
Bailey	\$11	Sven	\$ 2
Brian	\$ 9	Sarina	\$11
Betty	\$ 8	Sean	\$12
Bert	\$ 7	Sally	\$13



Suppose with some experience, the market settles on a single price. All trades are made at that price. (Hint: use the graph at right for scratch work.)

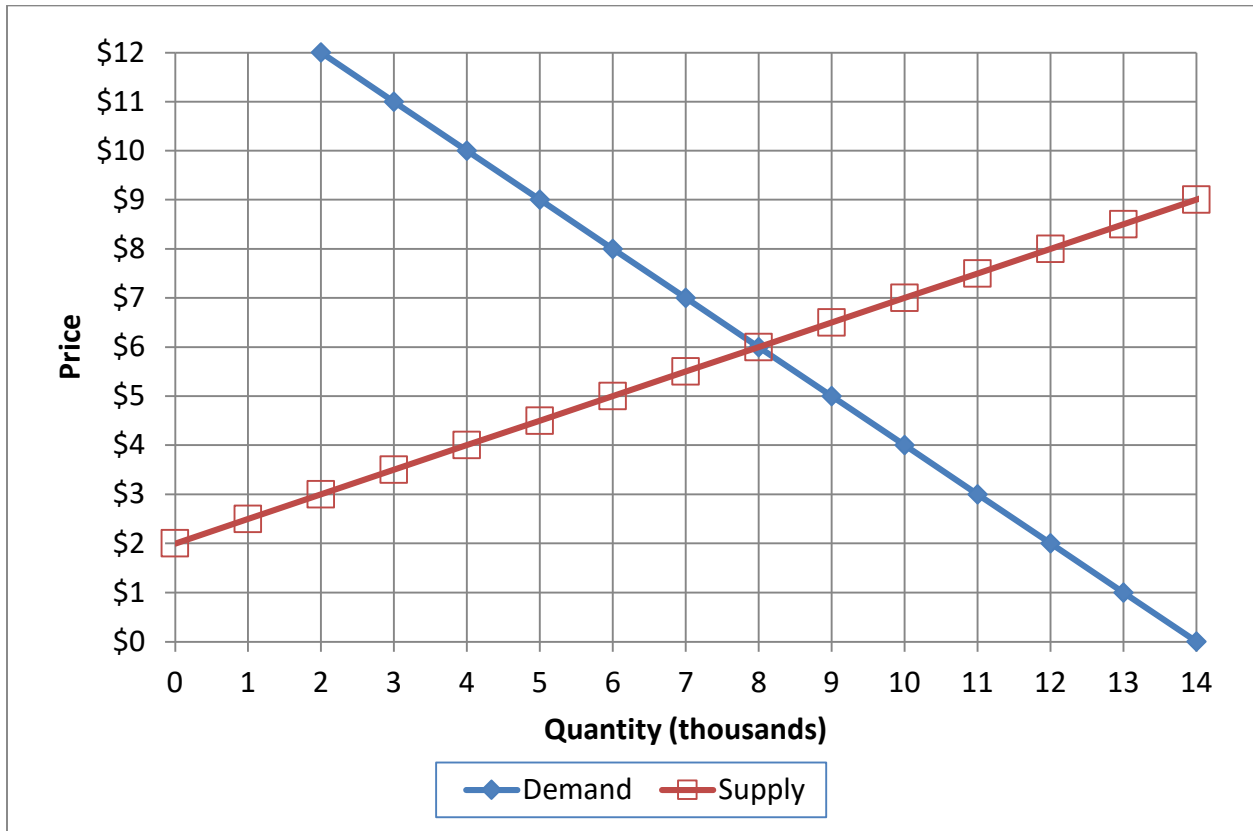
- a. If the price were \$3, would there be *excess demand*, *excess supply*, or *neither*?

Now consider the market equilibrium.

- b. What is the equilibrium price? Give an answer to the nearest whole dollar.
- c. How many units of the good will be sold in this market?
- d. Compute the total revenue received by sellers (which equals the total spending by buyers).
- e. Compute the combined total surplus (or gains from trade) of all buyers and sellers. (Check your answer carefully! No partial credit for being "close"!)
- f. Who enjoys higher surplus in this particular market, the *buyers* or the *sellers*? Or is buyers' total surplus *equal* to sellers' total surplus?

\$	
	units
\$	
\$	

(4) [Welfare analysis of tax or subsidy: 18 pts] The graph below shows the market for leaf rakes.

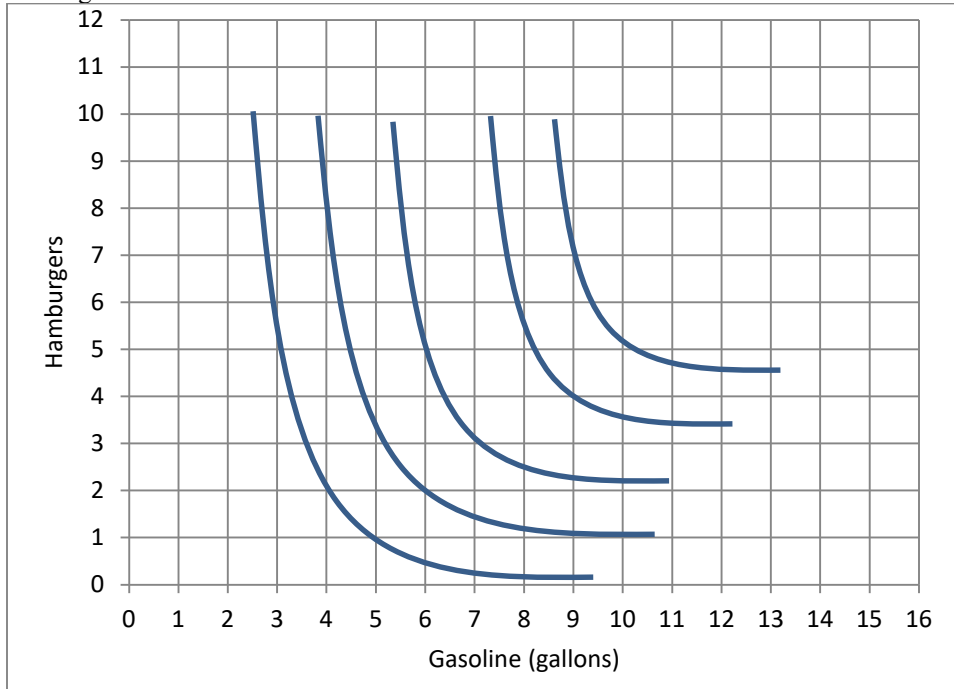


Suppose the government imposes an excise **tax of \$ 3** per leaf rake.

- Compute the equilibrium quantity sold.
- Compute the equilibrium net price received by sellers (excluding the tax).
- Compute the equilibrium total price paid by buyers (including the tax).
- Does producer surplus *increase, decrease, or remain constant* because of the tax?
- By how much?
- Does consumer surplus *increase, decrease, or remain constant* because of the tax?
- By how much?
- Compute the total tax revenue collected by the government.
- Compute the deadweight social loss caused by the tax.

	thousand
\$	per rake
\$	per rake
\$	thousand
\$	thousand
\$	thousand
\$	thousand

(5) [Consumer choice and demand: 14 pts] The indifference curves in the graph below represent Beto’s preferences for hamburgers and gasoline.



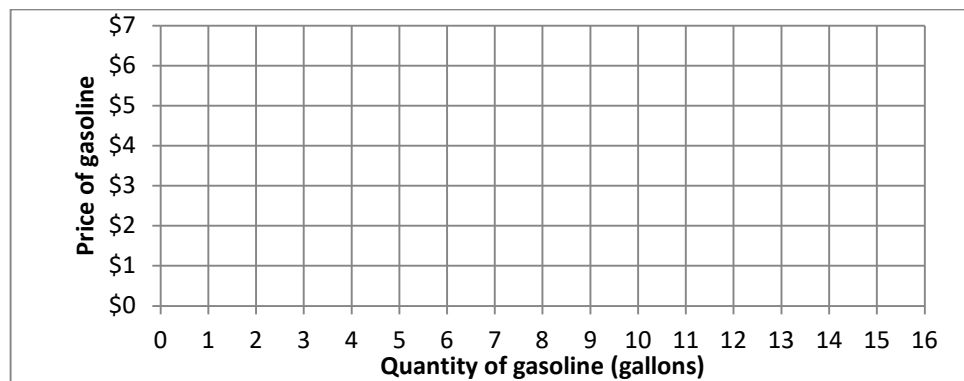
- a. Would Beto rather have 2 hamburgers and 6 gallons of gasoline, or 6 hamburgers and 3 gallons of gasoline?
- b. Would Beto rather have 5 hamburgers and 6 gallons of gasoline, or 8 hamburgers and 4 gallons of gasoline?

hamburgers and gallons of gasoline	gallons of gasoline
hamburgers and gallons of gasoline	gallons of gasoline

Suppose Beto has a budget of \$30 to spend on hamburgers and gasoline. The price of hamburgers is \$3.

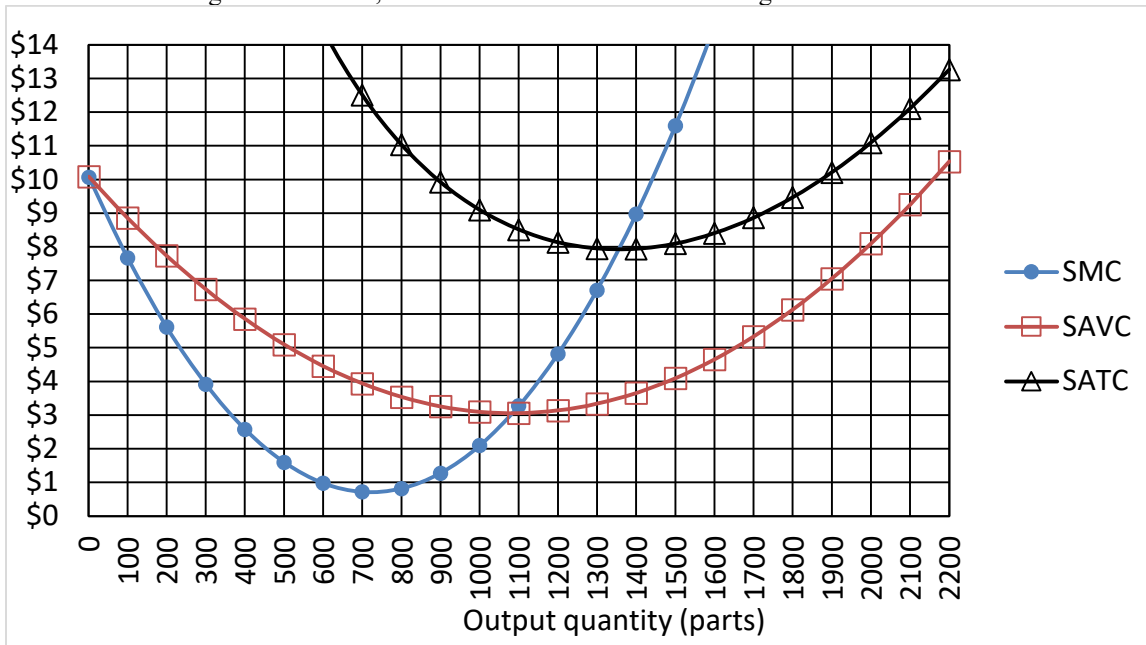
- c. **Using a straightedge**, carefully draw Beto’s budget line when the price of gasoline is \$2 per gallon. Label this budget line “A”.
- d. How much gasoline will Beto buy if the price of gasoline is \$2? gallons
- e. **Using a straightedge**, carefully draw Beto’s budget line when the price of gasoline is \$6 per gallon. Label this budget line “B”.
- f. How much gasoline will Beto buy if the price of gasoline is \$6? gallons

- g. Plot two points on Beto’s demand curve for gasoline, and sketch his demand curve at right.





(6) [Short-run cost curves and supply: 20 pts] XYZ Manufacturing Company makes a small part used in trucks. XYZ is a small company in a big market, and therefore takes its output price as given. In the short run, the company faces daily cost curves as shown in the following diagram. Here, SMC denotes short-run marginal cost, SAVC denotes short-run average variable cost, and SATC denotes short-run average total cost.



Suppose the company were currently producing 2000 parts for some unknown reason.

a. Compute the company's short-run total cost, to the nearest thousand dollars.

\$	thousand
\$	thousand
\$	thousand

b. Compute the company's short-run variable cost, to the nearest thousand dollars.

c. Compute the company's short-run fixed cost, to the nearest thousand dollars.

d. Suppose the company were currently producing 1000 parts for some unknown reason. If the company produced one more part, by how much would its total cost increase? That is, what would be the *change in total cost* as the company increased output from 1000 to 1001 parts? (Give an answer to the nearest dollar.)

\$
----

e. What is the company's break-even price—that is, the lowest price at which the company can avoid losses? (Give an answer to the nearest dollar.)

f. What is the company's shut-down price—that is, the lowest price at which it will remain in operation in the short run? (Give an answer to the nearest dollar.)

g. Suppose the price of parts is \$1. How many parts should the company produce? (Give an answer to the nearest hundred.)

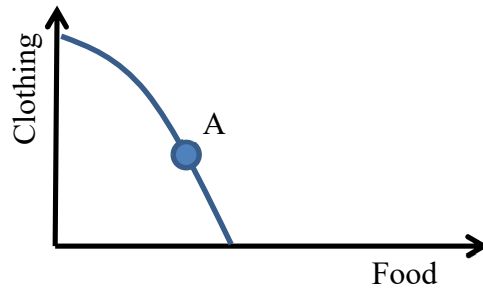
h. Will the company make a *profit* or a *loss* at a price of \$1?

i. Suppose the price of parts is \$9. How many parts should the company produce? (Give an answer to the nearest hundred.)

j. Will the company make a *profit* or a *loss* at a price of \$9?

\$
\$
parts
parts
parts

(7) [Economy-wide efficiency: 16 pts] The graph below shows a country's production possibility curve. The country is currently at point A, where the slope equals -2.



a. What is this **country's** opportunity cost of a unit of food?

units of clothing
units of food

b. What is this **country's** opportunity cost of a unit of clothing?

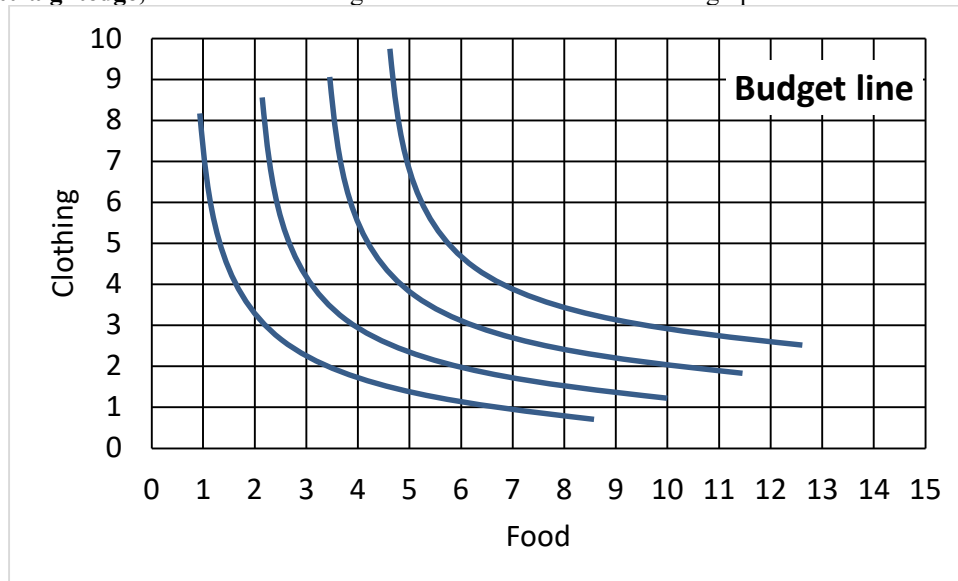
Assume this country's economy is in competitive equilibrium in all markets and the price of a unit of food is \$10.

c. What must be the price of a unit of clothing?

\$
----

Caitlin is a consumer in this economy. She has an income of \$50.

d. **Using a straightedge**, draw Caitlin's budget line in the indifference-curve graph below.



e. What is **Caitlin's** opportunity cost of a unit of food?

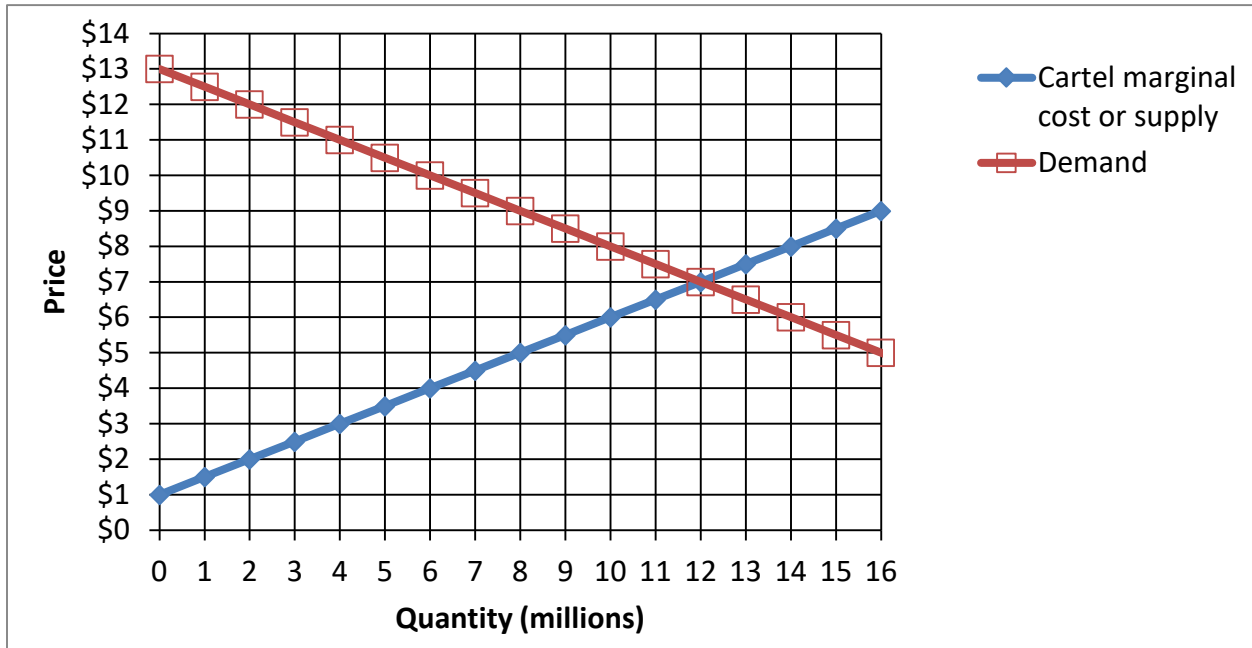
units of clothing
units of food
units of food

f. What is **Caitlin's** opportunity cost of a unit of clothing?

g. How many units of food will Caitlin choose to purchase?

h. At **Caitlin's** chosen bundle, what is her marginal rate of substitution—that is, the |slope| of her indifference curve? (Give a number.)

(8) [Competition versus collusion: 16 pts] Suppose a small group of firms produce citric acid, a food additive. The graph below shows the demand curve and the joint marginal cost or supply curve of the group of firms.



First, assume the firms *compete* with each other, each maximizing its own profit while taking the market price as given.

a. What will be the equilibrium market quantity?

	million
b. If output increased by one more unit at any firm, total costs would increase by how much?	\$
c. What will be the equilibrium market price?	\$

Second, alternatively assume the firms *collude* with each other, setting price jointly as a cartel to maximize the sum of their profits.

d. *Using a straightedge*, draw and label the colluding firms' marginal revenue curve.

e. What total quantity will the firms produce?

f. If output increased by one more unit at any firm, total costs would increase by how much?

g. What price will the firms jointly set?

h. Compute the social deadweight loss from collusion.

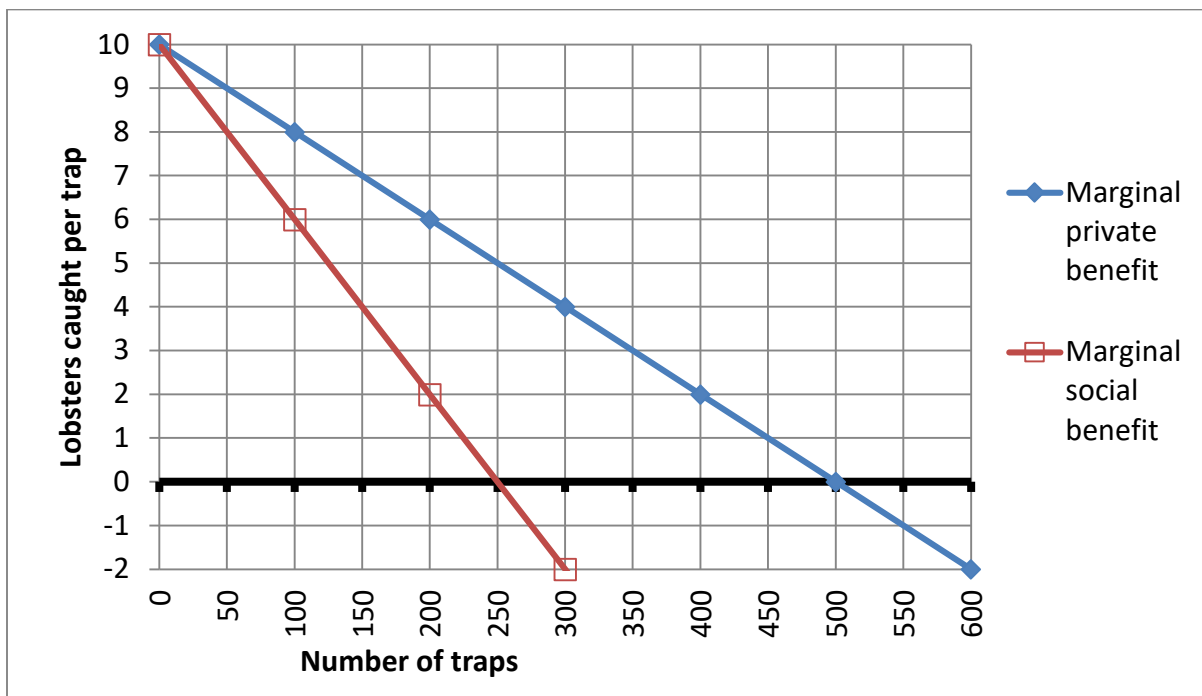
	million
	\$
	\$
	\$ million

(9) [Nonrival goods: 6 pts] Suppose a section of a river will be redeveloped for whitewater kayaking (by removing dams, placing rocks, etc.). It is estimated that **1000** people are likely to use the river, which will cost about **\$60,000** per kilometer to redevelop. A typical user's marginal benefit is given by **MB = 100 - 10 Q**, where Q is the length of the redeveloped section in kilometers.

- How many kilometers of the river would a typical *individual* pay to redevelop?
- Give an expression (or formula) for the marginal social benefit from river redeveloped. [Hint: This must be a formula containing one variable: Q.]
- Compute  $Q^*$  the *socially optimal* length of the section to be redeveloped.

	kilometers
MSB =	
	kilometers

(10) [Common property resources: 6 pts] Suppose in a certain bay, people trap lobsters. But each new lobster trap reduces the catch for all the other traps. Unfortunately, anyone who considers placing a trap does not think about the effects on others. The graph below shows average or *expected catch per trap* ("marginal private benefit") and the effect of each additional trap on the *total catch* ("marginal social benefit"). Note that the effect of each additional trap turns negative as large numbers of traps reduce the population of lobsters.



- How many traps will be placed if lobster trapping is unregulated?
- What is the socially optimal number of traps--that is, the number of traps that maximizes the total catch?
- Suppose a typical trapper is willing to pay \$5 per expected catch per trap. What fee (in dollars) would ensure that the optimal number of lobster traps are used?

	traps
	traps
\$	per trap

(11) [Externalities: 12 pts] The graph below shows the market for trees in a particular city. A tree provides shade for the homeowner who buys and plants one on their property, but also helps reduce summer temperatures in the whole neighborhood and makes the neighborhood more attractive. Therefore, in addition to demand and supply curves, a curve representing marginal social benefit is shown.



- Compute the (unregulated) competitive equilibrium price.
- Compute the (unregulated) competitive equilibrium quantity.
- Compute the economically efficient (or socially optimal) quantity.
- Compute the deadweight loss from unregulated competition.
- To eliminate this deadweight loss, should the government enact a *tax* or a *subsidy* on trees?
- What should be the tax rate or subsidy rate?

\$	per tree
	trees
	trees
\$	
\$	per tree

(12) [Regulating pollution: 19 pts] Five factories are each producing one unit of pollution per year. The government has determined that total pollution must be reduced to 2 units per year (a reduction of 3 units). The cost of cleaning up pollution at each factory is given below.

Factory	A	B	C	D	E
Annual cost of cleaning up pollution	\$45	\$35	\$25	\$20	\$15

**Command-and-control:**

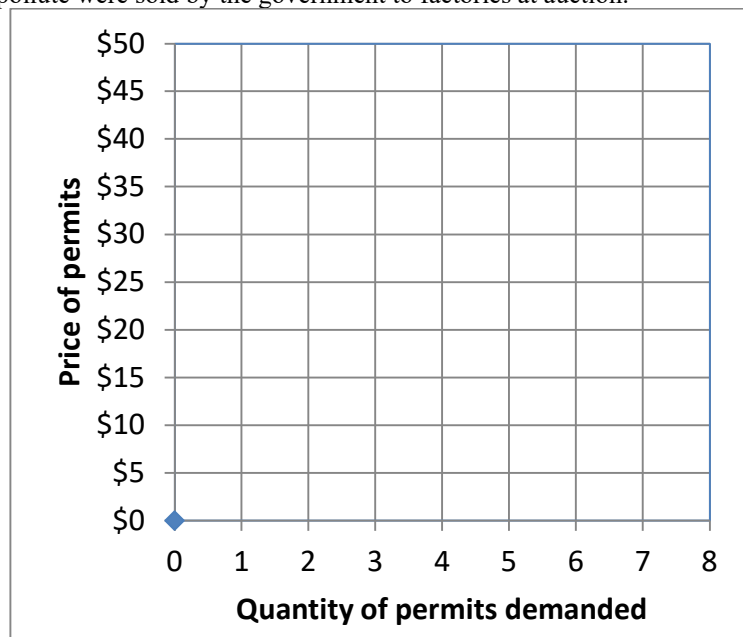
- a. To minimize the total cost of cleaning up, which 3 factories should be commanded to clean up? Give their letters.
- b. What would be the total cost of cleaning up for these 3 factories together?

	\$

Now suppose the government does not know each factory’s cost of cleaning up, so the command-and-control approach is infeasible. Consider the following alternative approaches.

**Auction:** Suppose 2 permits (or waivers) to pollute were sold by the government to factories at auction.

- c. [5 pts] Draw the factories’ demand curve for permits in the graph at right. Be sure to draw correct “stairsteps.”



In this auction, the price starts at \$0 and rises in increments of \$10.

- d. Which factories would win the permit? Give their letters.
- e. What would be the final auction price of a permit to pollute?
- f. What would be the total cost of cleaning up for those 3 factories that did not win permits in the auction?

	\$
	\$

**Pollution fee:** Suppose the government imposed a fee for pollution. Factories could either pay the fee or pay the cost of cleaning up.

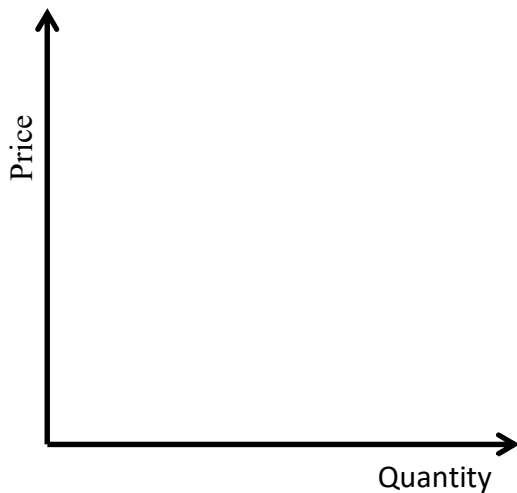
- g. What fee would reduce the amount of pollution to 2 units: \$0, \$10, \$20, \$30, \$40, \$50, or \$60?
- h. What would be the total cost of cleaning up for those 3 factories that chose not to pay the fee?

	\$
	\$

**III. Critical thinking:** Write a one-paragraph essay answering *one* question below (your choice). [4 pts]

- (1) Give an example of a government intervention that makes a market *less* efficient. Explain why the intervention decreases economic efficiency and illustrate your argument using a supply-and-demand graph. Label all curves. Shade and label the triangle of deadweight loss *caused* by government intervention.
- (2) Give an example of a government intervention that makes a market *more* efficient. Explain why the intervention increases economic efficiency and illustrate your argument using a supply-and-demand graph. Label all curves. Shade and label the triangle of deadweight loss *eliminated* by government intervention.

Please circle the question you are answering. Write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.



[end of exam]