ECON 002 - Principles of Microeconomics
Drake University, Spring 2023
William M. Boal

Signature: _____

Printed name: _____

FINAL EXAMINATION VERSION B

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. Numerical answers, if rounded, must be correct to at least 3 significant digits. 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, 36 pts total]

(1) In economics, *rational behavior* means
a. making sacrifices today for a better future.
b. maximizing one's income.
c. using math to make decisions.
d. ignoring "soft" concerns like friendships and charity.
e. doing the best one can with what one has.

(2) Amelia buys a ticket to a concert for $100. When she arrives at the concert hall, she discovers that scalpers are willing to pay $200 for her ticket. Her *opportunity cost* of attending the concert is now
a. $0.
b. $100.
c. $200.
d. $300.

(3) A breakfast café charges $3.00 for one pancake, $4.00 for two pancakes, and $4.50 for three pancakes. What is the marginal cost of the *third* pancake?
a. $0.50.
b. $1.00.
c. $1.50.
d. $4.50.

The next three questions refer to the following information. Farm X can produce 10 units of tomatoes or 20 units of peppers per acre. Farm Y can produce 30 units of tomatoes or 30 units of peppers per acre.

(4) What is Farm X's opportunity cost of a unit of tomatoes?
a. 1 unit of peppers.
b. 2 units of peppers.
c. 20 units of peppers.
d. 2 units of tomatoes.

(5) What is Farm Y's opportunity cost of a unit of tomatoes?
a. 1 unit of peppers.
b. 2 units of peppers.
c. 10 units of peppers.
d. 30 units of tomatoes.

(6) Which farm has a comparative advantage in tomatoes?
a. Farm X.
b. Farm Y.
c. Both farms.
d. Neither farm.

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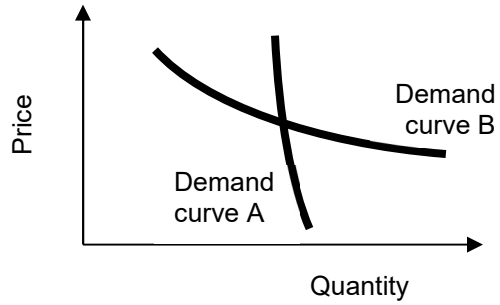
(7) A rise in the price of ice cream will shift the demand for frozen yogurt to the right, assuming ice cream and frozen yogurt are
a. complementary goods.
b. substitute goods.
c. normal goods.
d. inferior goods.

(8) As consumers' incomes rise, they typically go to more music concerts, because concerts are
a. a substitute good.
b. a complementary good.
c. an inferior good.
d. a normal good.

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



(10) Assuming that medical care is a *necessary good*, the income elasticity of demand for medical care must be
a. negative.
b. exactly zero.
c. between zero and one.
d. exactly one.
e. greater than one.

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

	Country X		Country Y	
Price	Q_D	Q_S	Q_D	Q_S
\$1	60	30	50	25
\$2	50	50	40	30
\$3	40	70	75	45
\$4	30	90	70	50
\$5	20	110	65	55
\$6	10	130	60	60
\$7	0	150	0	65

(11) In the absence of international trade, Country X's equilibrium price of soybeans would be
a. \$2.
b. \$3.
c. \$4.
d. \$5.
e. \$6.

(12) In the absence of international trade, Country Y's equilibrium price of soybeans would be
a. \$2.
b. \$3.
c. \$4.
d. \$5.
e. \$6.

(13) With international trade, the equilibrium price of soybeans in both countries would be
a. \$2.
b. \$3.
c. \$4.
d. \$5.
e. \$6.

(14) Who in Country X benefits from international trade in soybeans?
a. Buyers in Country X.
b. Sellers in Country X.
c. Both buyers and sellers in Country X.
d. Neither buyers nor sellers in Country X.

(15) Suppose the price of watermelons is \$5 in Kansas City and the cost of shipping a watermelon between Des Moines and Kansas City is \$2. Markets are *in equilibrium* if the price of melons in Des Moines is
a. \$1.
b. \$4.
c. \$8.
d. \$10.

(16) A quota (or legal maximum quantity) on *buying* ivory would cause its price to
a. rise.
b. fall.
c. rise or fall, depending on the shapes of the demand and supply curves.
d. remain constant.

(17) Suppose the price elasticity of supply for apartment rentals is 0.3 and the price elasticity of demand is -1.0 . If the city imposes a tax on apartment rentals,
a. sellers (landlords) will pay most of the tax.
b. buyers (renters) will pay most of the tax.
c. sellers and buyers will each pay half of the tax.
d. Answer depends on which side is legally required to remit the tax to the government.

(18) A change in the number of people who buy pomegranate juice is called a change at the
a. extensive margin.
b. intensive margin.
c. marginal product.
d. marginal revenue.

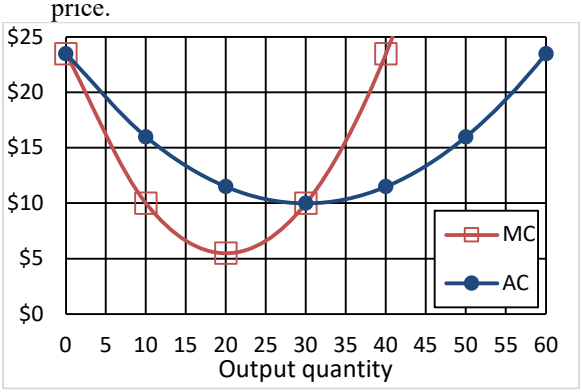
(19) The change in a firm's total revenue divided by the change in its output by definition equals the firm's
a. total revenue.
b. average revenue.
c. marginal revenue.
d. total cost.
e. average cost.
f. marginal cost.

(20) The slope of the firm's total cost curve by definition equals the firm's
a. total revenue.
b. average revenue.
c. marginal revenue.
d. total cost.
e. average cost.
f. marginal cost.

(21) A firm's total cost divided by its total output by definition equals the firm's
a. total revenue.
b. average revenue.
c. marginal revenue.
d. total cost.
e. average cost.
f. marginal cost.

(22) A small firm in a big market maximizes its profit by
a. adjusting its output quantity so that price equals marginal cost.
b. shifting its marginal cost curve up or down so that price equals marginal cost at its desired output level.
c. adjusting its price so that price equals marginal cost.
d. all of the above.

(23) ABC Company has very small market share and therefore takes the market price as given. Its marginal cost (MC) and average cost (AC) curves are shown below. To maximize profit, ABC Company should set its output at
a. 20 units.
b. 30 units.
c. 40 units.
d. 50 units.
e. Cannot be determined without knowing market price.



(24) *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.

(25) The assumption that firms take the market price as given makes more sense if
a. there are a large number of firms in the market.
b. market demand is inelastic.
c. the owners of the firms are personal friends.
d. the necessary inputs to production are scarce.

(26) If consumers view the products of different firms as *perfect substitutes*, they will
a. stay with their current brand, even if it is a little more expensive.
b. flip a coin to decide which brand to buy.
c. buy some of each.
d. choose whichever is cheaper.

(27) Suppose a hotdog vendor sells 20 hotdogs per hour if the price is $2, and sells 21 hotdogs if the price is $1.95. The vendor's marginal revenue of the 21st hotdog is therefore
a. $0.05 .
b. $0.95 .
c. $1.00 .
d. $1.95 .
e. $2.00 .
f. $20.00 .

(28) A monopolist always sets price
a. below marginal cost.
b. equal to marginal cost.
c. above marginal cost.
d. cannot be determined from the information given.

(29) A monopoly causes social deadweight loss because
a. it creates a concentration of power.
b. some buyers, willing to pay the marginal cost, do not get served.
c. it redistributes income from the poor to the rich.
d. big corporations are bad for society.

(30) The Cournot model of oligopoly predicts that as the number of firms decreases in an industry, the market price
a. approaches zero.
b. approaches marginal cost.
c. approaches the monopoly price.
d. remains constant.

(31) 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.

(32) Newspapers like the *Wall Street Journal* and the *New York Times* offer online versions. Many people can access the online versions without interfering with each other. However, the newspapers can require viewers to pay for access. An online newspaper is therefore
a. a nonrival good.
b. a nonexcludable good.
c. both of the above.
d. none of the above.

(33) If a highway is not crowded and there are no toll gates, the highway is
a. a nonrival good.
b. a nonexcludable good.
c. both of the above.
d. none of the above.

(34) 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.

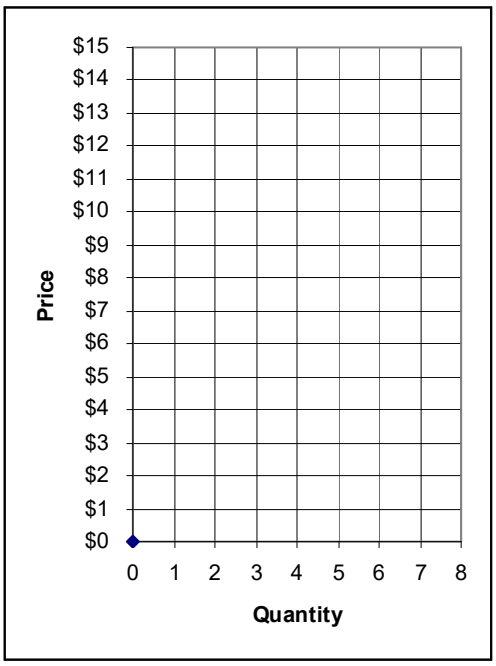
(35) After my neighbor bought and installed outdoor lights, crime decreased at all properties in my neighborhood. My neighbor's outdoor lights created
a. an external benefit.
b. an external cost.
c. a common property resource.
d. an inferior good.

(36) Suppose 1000 residents would each be willing to pay $20 for a fireworks show, a nonrival good which they could each view without interfering with each other. Then the social benefit of the fireworks show is
a. $20.
b. $50.
c. $1000.
d. $20,000.

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) [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	\$14	*Sue*	\$ 1
Barb	\$13	*Steve*	\$ 2
Ben	\$12	*Sam*	\$ 3
Bailey	\$12	*Sven*	\$ 4
Brian	\$11	*Sarina*	\$ 9
Betty	\$ 1	*Sean*	\$14
Bert	\$ 1	*Sally*	\$15



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 \$2, would there by *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? units

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"!) \$

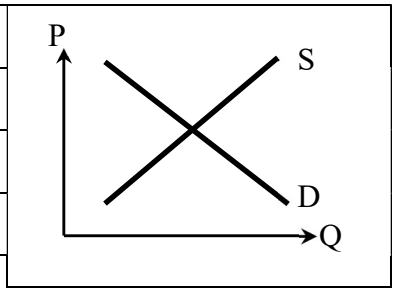
f. Who enjoys higher surplus in this particular market, the *buyers* or the *sellers?* Or is buyers' total surplus *equal* to sellers' total surplus?

(2) [Shifts in demand and supply: 15 pts] Analyze each of the following markets according to the accompanying imaginary scenario.

a. Consider the market for ***high-efficiency light bulbs***. Suppose new technology allows these bulbs to be manufactured at much lower cost.

Does demand shift *left*, shift *right*, or remain *unchanged* ?	
Does supply shift *left*, shift *right*, or remain *unchanged* ?	
Does the equilibrium price *increase, decrease,* or *cannot be determined* ?	
Does the equilibrium quantity *increase, decrease,* or *cannot be determined* ?	

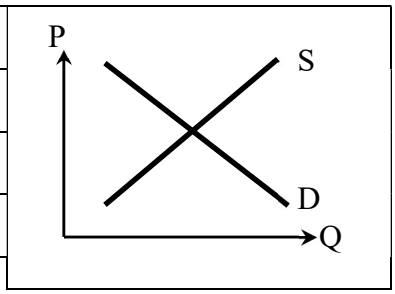
Sketch a graph of this scenario at right, showing which curve(s) shift(s).



b. Consider the market for ***chicken***: Suppose the price of beef rises.

Does demand shift *left*, shift *right*, or remain *unchanged* ?	
Does supply shift *left*, shift *right*, or remain *unchanged* ?	
Does the equilibrium price *increase, decrease,* or *cannot be determined* ?	
Does the equilibrium quantity *increase, decrease,* or *cannot be determined* ?	

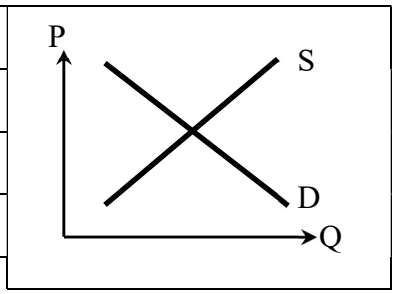
Sketch a graph of this scenario at right, showing which curve(s) shift(s).



c. Consider the market for ***cotton clothing***: A new fashion trend favors natural fibers like cotton. Simultaneously, a blight raises the price of raw cotton.

Does demand shift *left*, shift *right*, or remain *unchanged* ?	
Does supply shift *left*, shift *right*, or remain *unchanged* ?	
Does the equilibrium price *increase, decrease,* or *cannot be determined* ?	
Does the equilibrium quantity *increase, decrease,* or *cannot be determined* ?	

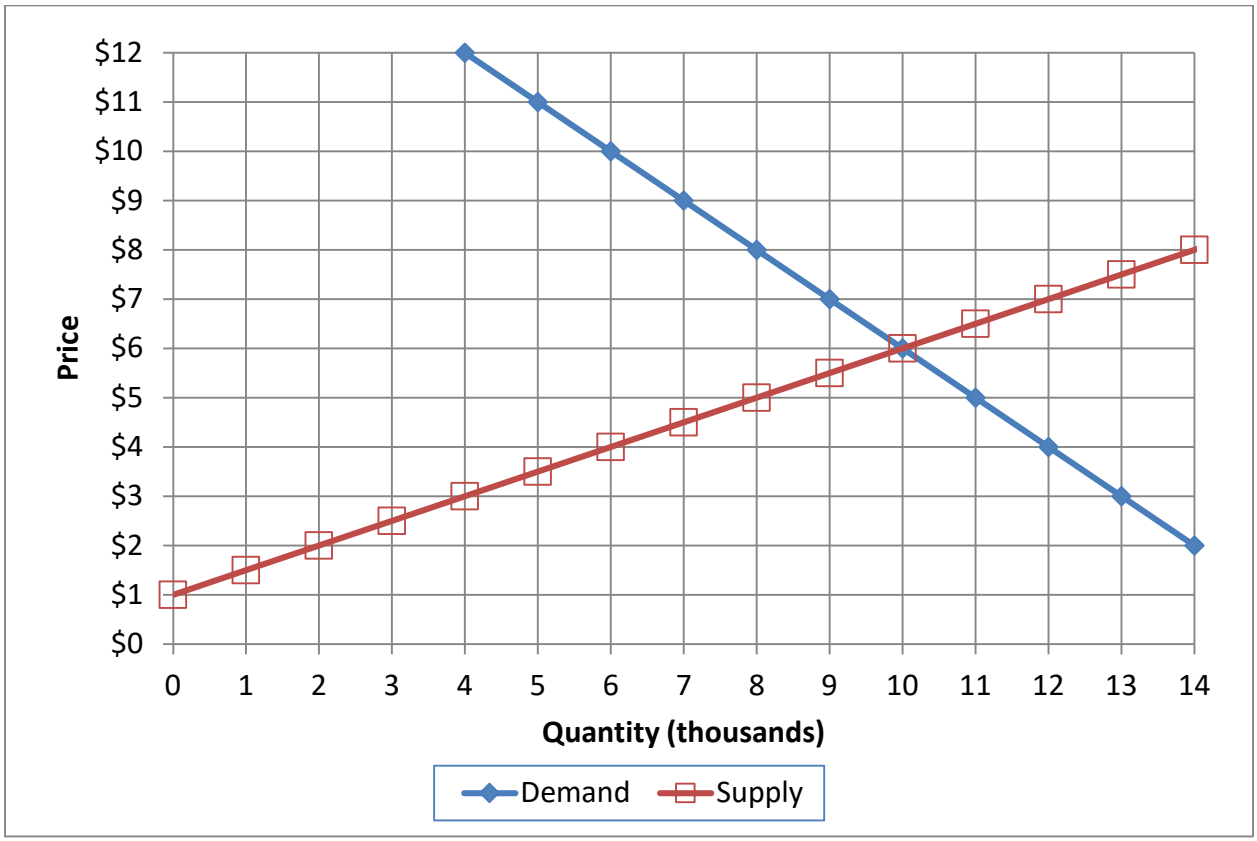
Sketch a graph of this scenario at right, showing which curve(s) shift(s).



(3) [Using price elasticity of demand: 10 pts] Suppose the water utility *raises* its price by 8%. Suppose the price elasticity of demand for water is -0.75. 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 consumers' spending on water *increase*, *decrease*, or remain *constant*?	
e. ... by approximately how much?	%

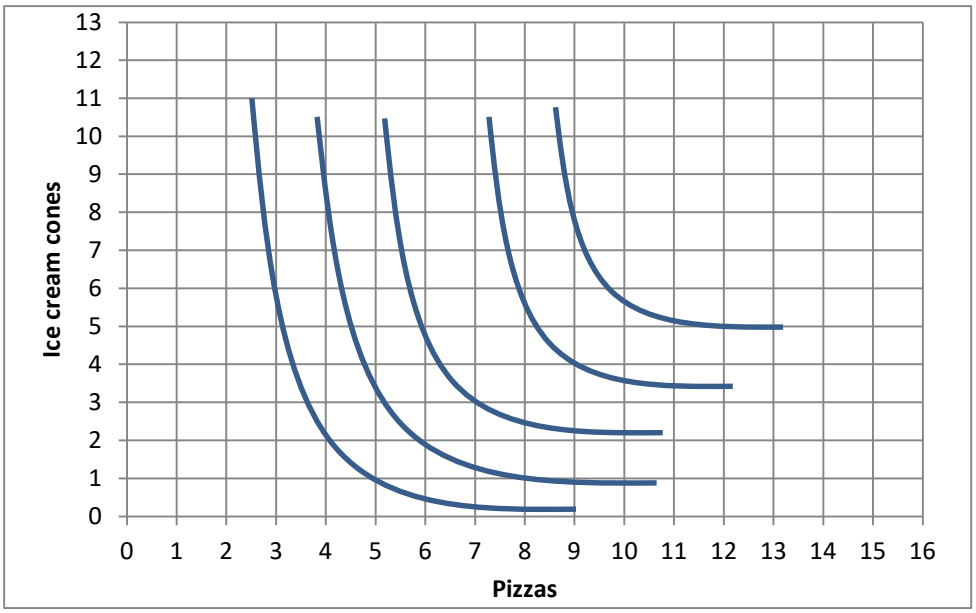
(4) [Welfare analysis of tax or subsidy: 18 pts] The graph below shows the market for snow shovels.



Suppose the government pays a **subsidy of $ 3** per snow shovel.

a. Compute the equilibrium quantity sold.		thousand
b. Compute the equilibrium total price received by sellers (including the subsidy).	$	per snow shovel
c. Compute the equilibrium net price paid by buyers (excluding the subsidy).	$	per snow shovel
d. Does producer surplus *increase, decrease,* or *remain constant* because of the subsidy?		
e. By how much?	$	thousand
f. Does consumer surplus *increase, decrease,* or *remain constant* because of the subsidy?		
g. By how much?	$	thousand
h. Compute the direct cost of the subsidy to the government—that is, the amount that the government will have to pay buyers and/or sellers.	$	thousand
i. Compute the deadweight social loss caused by the subsidy.	$	thousand

(5) [Consumer choice and demand: 14 pts] The indifference curves in the graph below represent Barbara's preferences for ice cream cones and pizzas.



a. Would Barbara rather have 3 pizzas and 6 ice cream cones, or 5 pizzas and 3 ice cream cones?

	pizzas and	ice cream cones

b. Would Barbara rather have 10 pizzas and 1 ice cream cone, or 7 pizzas and 3 ice cream cones?

	pizzas and	ice cream cones

Suppose Barbara has a budget of \$60 to spend on pizzas and ice cream cones. The price of ice cream cones is \$6.

c. **Using a straightedge**, carefully draw Barbara's budget line when the price of pizzas is \$4. Label this budget line "A".

d. How many pizzas will Barbara buy if the price of pizzas is \$4?

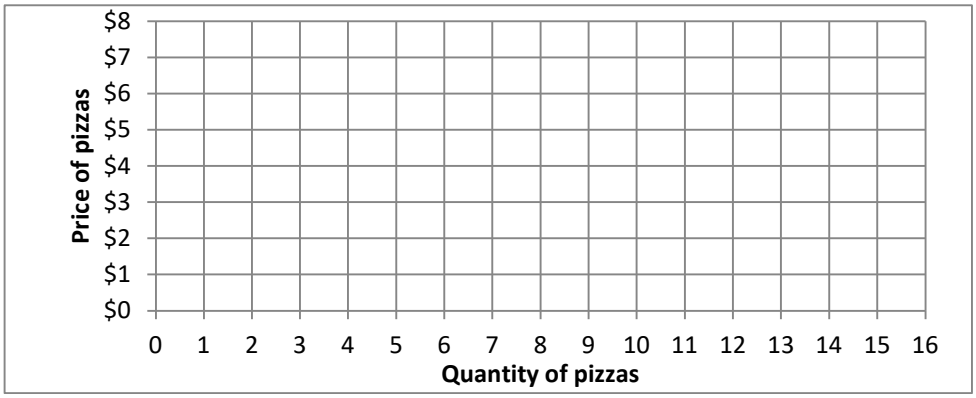
	pizzas

e. **Using a straightedge**, carefully draw Barbara's budget line when the price of pizzas is \$6. Label this budget line "B".

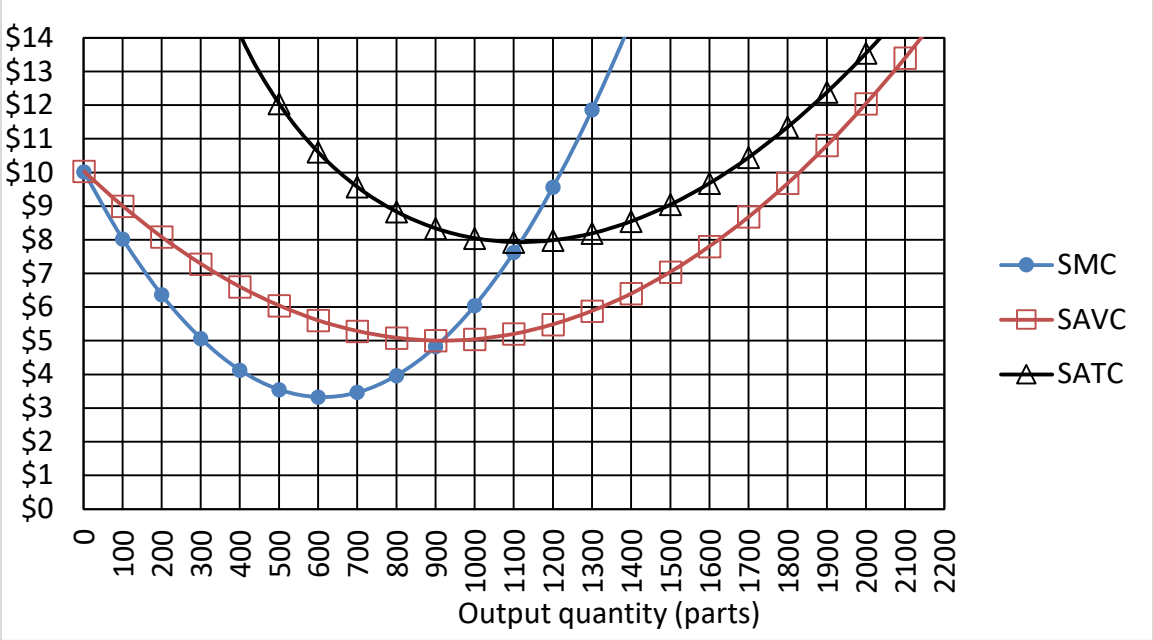
f. How many pizzas will Barbara buy if the price of pizzas is \$6?

	pizzas

g. Plot two points on Barbara's demand curve for pizzas, and sketch her 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 500 parts for some unknown reason.

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

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

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

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.) $

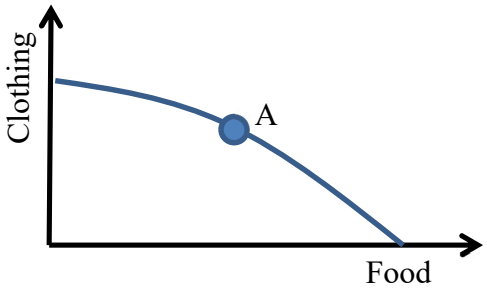
g. Suppose the price of parts is $12. How many parts should the company produce? (Give an answer to the nearest hundred.) parts

h. Will the company make a *profit* or a *loss* at a price of $12?

i. Suppose the price of parts is $4. How many parts should the company produce? (Give an answer to the nearest hundred.) parts

j. Will the company make a *profit* or a *loss* at a price of $4?

(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 **-1/2**.



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

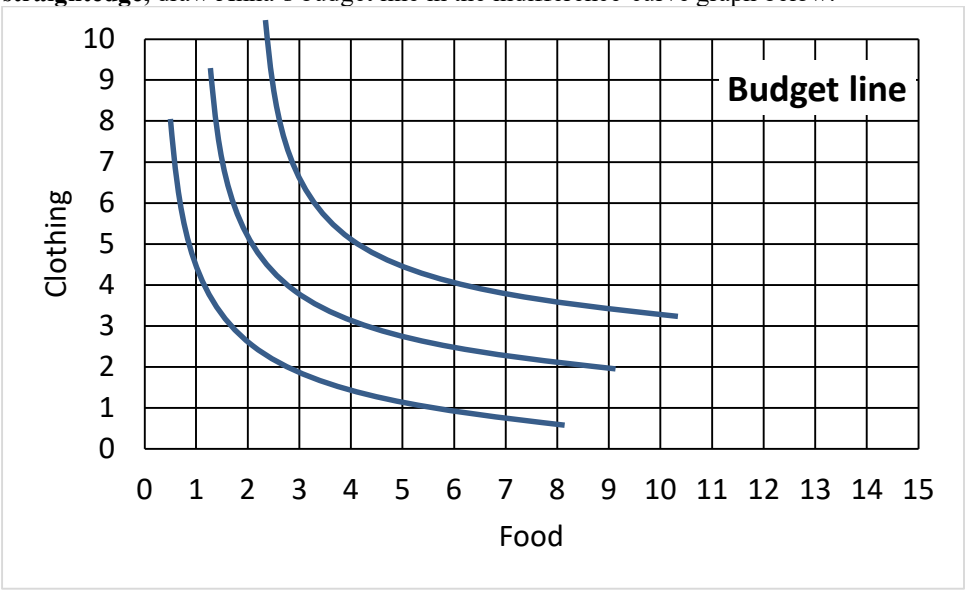
b. What is this **country's** opportunity cost of a unit of clothing? | units of food

Assume this country's economy is in competitive equilibrium in all markets and the price of a unit of clothing is **$12.**

c. What must be the price of a unit of food? | $

Anna is a consumer in this economy. She has an income of **$ 60**.

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



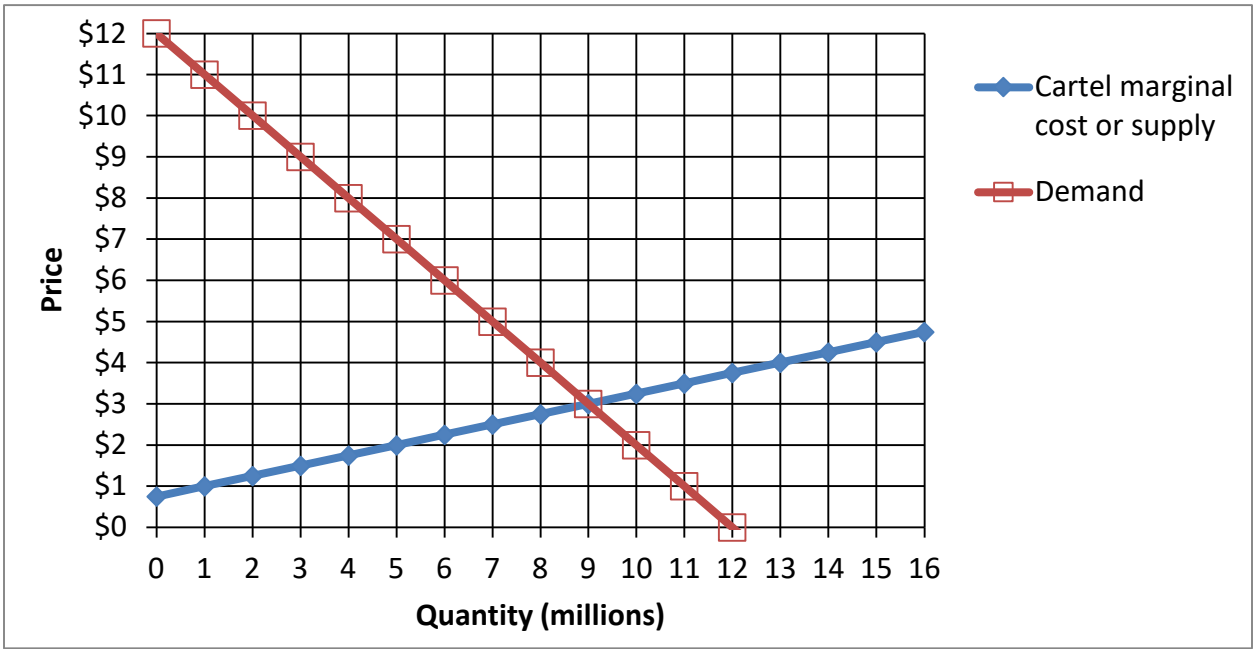
e. What is **Anna's** opportunity cost of a unit of food? | units of clothing

f. What is **Anna's** opportunity cost of a unit of clothing? | units of food

g. How many units of clothing will Anna choose to purchase? | units of clothing

h. At **Anna'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 laundry soap. 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.

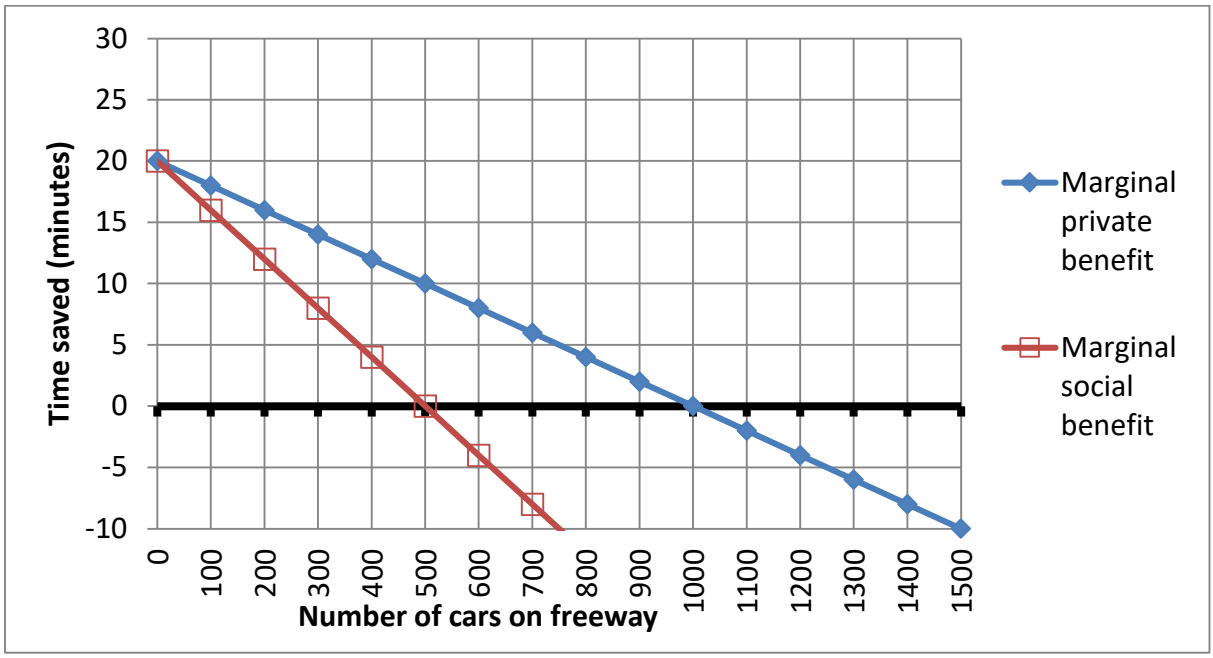
e. What total quantity will the firms produce?	million
f. If output increased by one more unit at any firm, total costs would increase by how much?	$
g. What price will the firms jointly set?	$
h. Compute the social deadweight loss from collusion.	$ million

(9) [Nonrival goods: 6 pts] Suppose **2000** people live near a proposed bike trail. The trail will cost **$20,000** per mile to build. Let Q denote the length of the bike trail in miles. A typical individual person's marginal benefit from this bike trail is given by the following expression (or formula): **MB = 50 – 5 Q** .

a. How many miles of bike trail would a typical *individual* pay to build for their own use?
b. Give an expression (or formula) for the marginal social benefit from the bike trail. [Hint: This must be a formula containing one variable: Q.]
c. Compute Q* the *socially-optimal* length of the bike trail.

miles
MSB =
miles

(10) [Common property resources: 6 pts] A certain freeway can easily become congested. It is the quickest route to downtown, but during rush hour, when one car enters the freeway, all the cars already on the freeway slow down a bit. The graph below shows the average time saved by each car when it enters the freeway ("marginal private benefit"), and the change in total time saved by all cars when another car enters the freeway ("marginal social benefit"). Note that the change in total time saved by all cars turns negative as the freeway becomes congested.

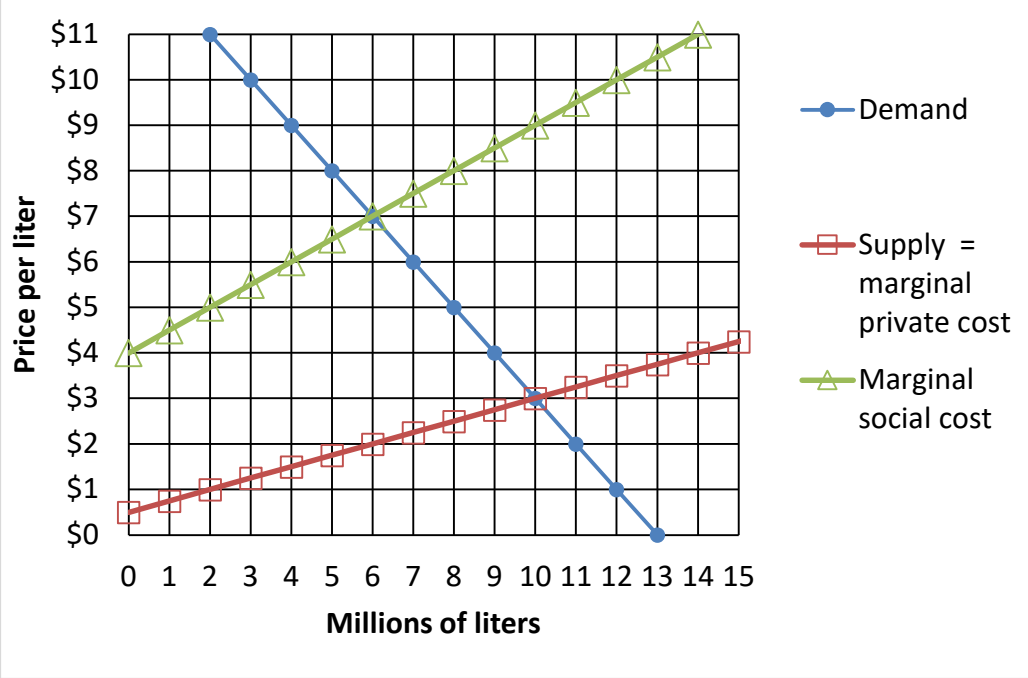


a. How many cars will enter the freeway if entry onto the freeway is unregulated?

b. What is the socially-optimal number of cars on the freeway—that is, the number of cars that maximizes total time saved by all cars on the freeway?
c. Suppose a typical driver is willing to pay $1 for each five minutes saved by entering the freeway. What toll (in dollars) would ensure that the optimal number of cars entered the freeway?

cars
cars
$

(11) [Externalities: 12 pts] The graph below shows the market for a particular chemical that, when used, creates a health hazard for the entire area, an external cost born by other people. Therefore, in addition to demand and supply curves, a curve representing marginal social cost is shown.



a. Compute the (unregulated) competitive equilibrium price.	$ per liter
b. Compute the (unregulated) competitive equilibrium quantity.	million liters
c. Compute the economically efficient (or socially optimal) quantity.	million liters
d. Compute the deadweight loss from unregulated competition.	$ million
e. To eliminate this deadweight loss, should the government enact a *tax* or a *subsidy*?	
f. What should be the tax rate or subsidy rate?	$ per liter

(12) [Regulating pollution: 19 pts] Seven factories are each producing one unit of pollution per year. The government has determined that total pollution must be reduced to **4** 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	F	G
Annual cost of cleaning up pollution	$45	$40	$40	$35	$25	$15	$5

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?

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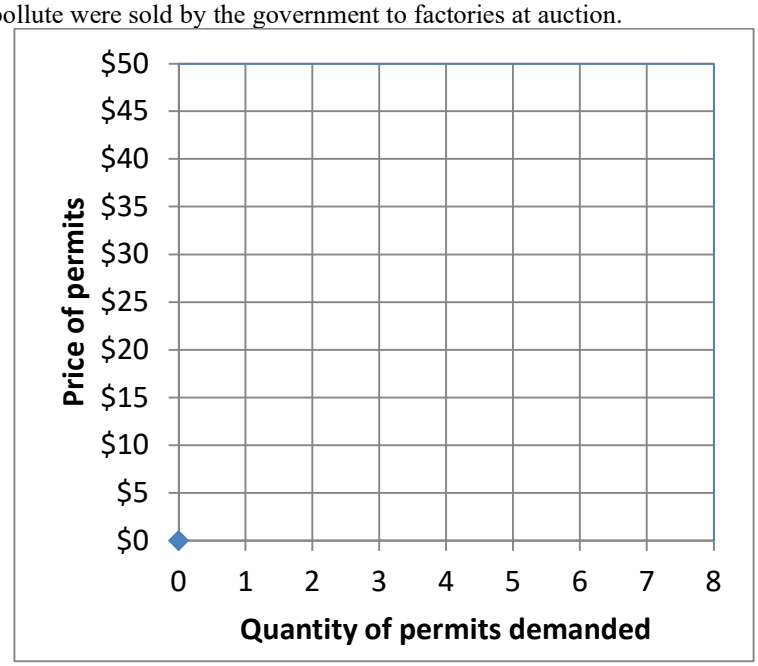
Now suppose the government does not know each factory's cost of cleaning up, so the command-and-control approach is infeasible. Consider the following alternative approaches.

Auction: Suppose **4** permits (or waiver) 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?

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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 **4** 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?

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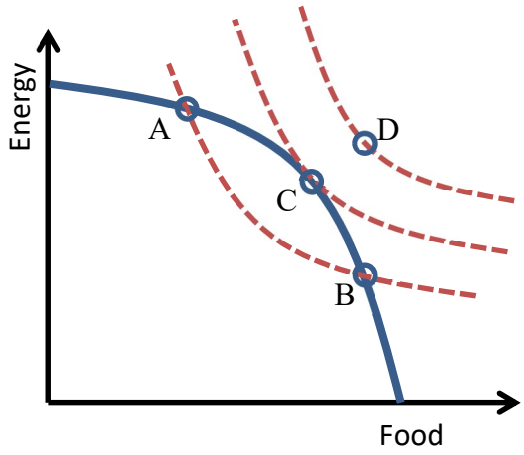
III. Critical thinking: Write a one-paragraph essay answering ***one*** question below (your choice). [4 pts]

(1) Give an example of a good or service that you consume that is *nonrival*. Explain why this good is a nonrival good. (Ignore the graph.)

(2) The graph below describes the economy of Country X. The solid curve is Country X's production possibility curve and the dashed curves are indifference curves for a representative consumer. Both industries are competitive. The food industry causes no externalities but the energy industry causes substantial external costs, so that too much energy is produced compared to the efficient quantity. Where is Country X's economy—point A, B, C, or D? Why?

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]