ECON 002 - Principles of Microeconomics   Signature: _____
Drake University, Fall 2016
William M. Boal   Printed name: _____

Please indicate your section: ☐ 8:00   ☐ 9:00

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, 11 pts total]

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

(2) The graph below shows a country's production-possibility curve. By definition, what is held constant along this curve?
a. Output of food.
b. Output of other goods.
c. The country's total inputs.
d. The prices of food and other goods.
e. None of the above.
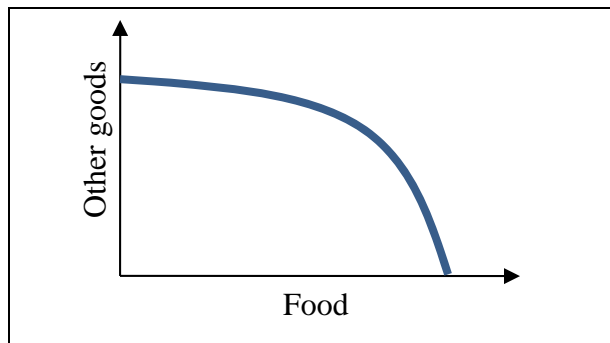
(3) Some estimates show that rich people buy more clothing than poor people, but they spend a *smaller fraction* of their income on clothing than poor people do. If this is true, then the income elasticity of demand for clothing must be
a. negative.
b. exactly zero.
c. between zero and one.
d. exactly one.
e. greater than one.

(4) Suppose the price elasticity of demand for hotel rooms in a small city is -5.0 and the price elasticity of supply is 1.5. If a tax is imposed on hotel rooms in this city,
a. Sellers (hotel operators) will pay most of the tax.
b. Buyers (guests) 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.

(5) The shape and position of a person's indifference curves depend on
a. their preferences for different bundles.
b. their income.
c. the prices they face in the market.
d. all of the above.

(6) A small firm in a big market maximizes its profit by
a. moving its cost curves so that price equals marginal cost at its desired output level.
b. adjusting price so that price equals marginal cost.
c. adjusting output so that price equals marginal cost.
d. all of the above.

(7) 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 .

(8) Marginal-cost pricing occurs in markets characterized by
a.   monopolistic competition.
b.   Cournot oligopoly.
c.   perfect competition.
d.   monopoly.
e.   both (a) and (c).

(9) A large grocery store attracts many customers who also stop to shop at *other* nearby smaller stores. Those nearby stores become more profitable as a result. A large grocery store therefore creates
a.   an external benefit.
b.   an external cost.
c.   a differentiated product.
d.   a superior good.

(10) Water aquifers (underground water sources) in the western United States are rapidly being depleted. No one can be prevented from taking water from a well on their own property—yet the more water is taken, the less is left for other people. Water aquifers in the western United States are therefore
a.   a rival good.
b.   an excludable good.
c.   both of the above.
d.   none of the above.

(11) Economists believe that environmental problems are caused, for the most part, by
a.   market power.
b.   lack of awareness.
c.   moral failing.
d.   misaligned incentives.

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 highway department increases the toll on a particular road by 5%. Also suppose the price elasticity of demand for travel on that road is -1.4. Assume everything else affecting demand for travel on that road remains constant.

    a. According to the information above, is demand for travel on this road *elastic, inelastic,* or *unitary-elastic*?

    b. As the price rises, will the number of cars on this road *increase*, *decrease*, or remain *constant*?

    c. ... by approximately how much?   %

    d. Will the total toll revenue received by the highway department *increase*, *decrease*, or remain *constant*?

    e. ... by approximately how much?   %

(2) [Production functions: 8 pts] Sitwell Folding Chair Company has the hourly production function shown below.
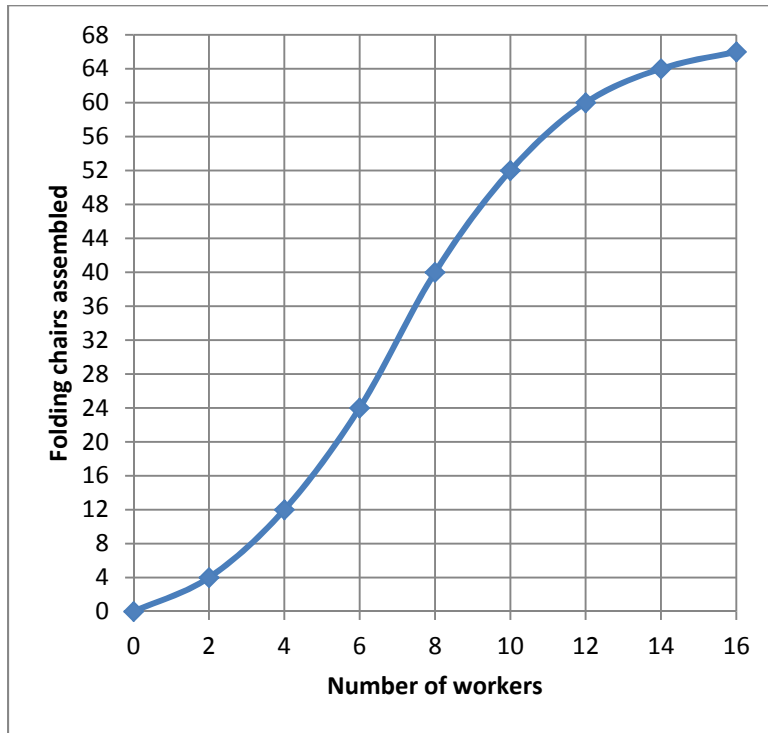
a. If the company employs 6 workers, what is their *average product*? | chairs per worker

b. If the company employs 8 workers, what is their *average product*? | chairs per worker

c. What is the *marginal product* of workers, as the number of workers increases from 2 to 4? | chairs per worker

d. What is the marginal product of workers, as the number of workers increases from 4 to 6? | chairs per worker

(3) [Basic definitions, cost and revenue: 3 pts] Insert the appropriate term from the list below in each box. The same term may be entered in more than one box.

Total revenue   *Average revenue*   *Marginal revenue*
Total cost   *Average cost*   *Marginal cost*

a. Increase in total cost from producing another unit of output.

b. Total cost divided by the quantity of output.

c. Price times quantity of output.

(4) [Comparative advantage, gains from trade: 17 pts] Country X and Country Y can each produce cars and refrigerators. They each face a tradeoff between these two products because of limited workforces. Their production possibility curves are shown below.
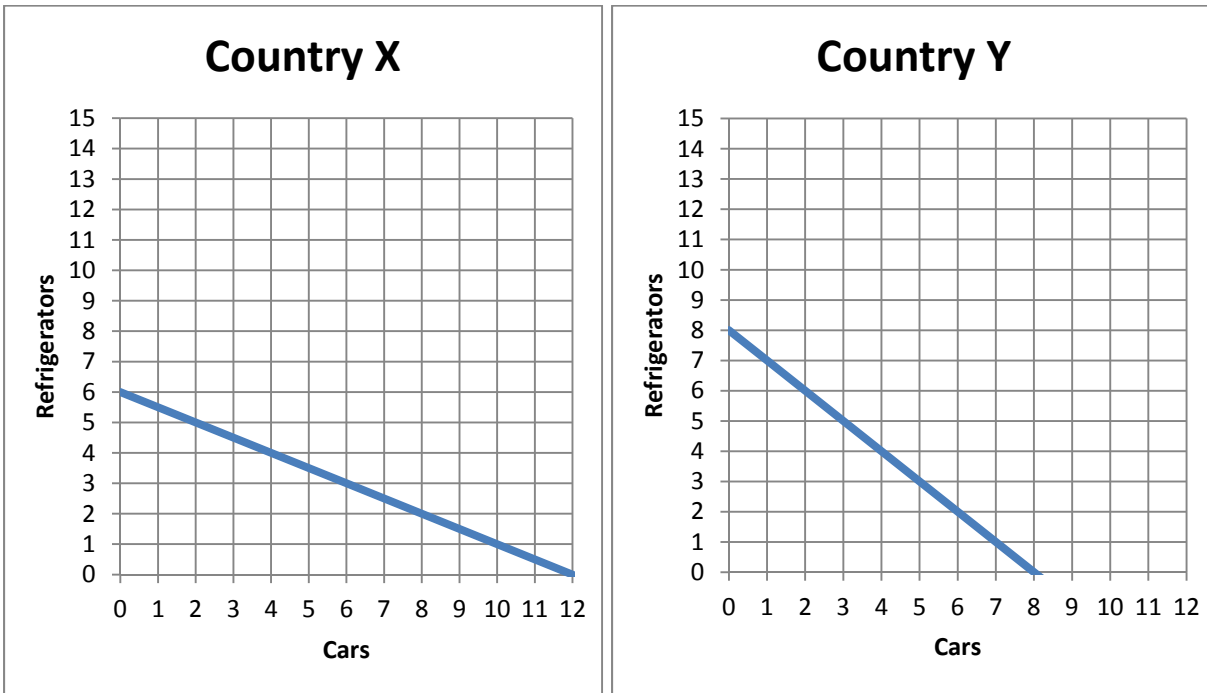
a. What is Country X's opportunity cost of producing a car?

b. What is Country Y's opportunity cost of producing a car?

c. What is Country X's opportunity cost of producing a refrigerator?

d. What is Country Y's opportunity cost of producing a refrigerator?

e. Which country has a comparative advantage in producing cars?

f. Which country has a comparative advantage in producing refrigerators?

|	
	refrigerators
	refrigerators
	cars
	cars

g. [3 pts] Fill in the blanks: *Both* countries can consume combinations of products *outside* their individual

   production possibility curves if _____ exports *two* refrigerators to

   _____, which exports _____ cars in return.

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

(5) [Shifts in demand and supply: 15 pts] Analyze each of the following markets according to the accompanying imaginary scenario.
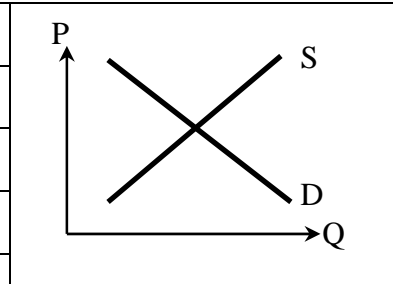
a. Consider the market for **luxury cars**. Suppose a boom raises consumers' incomes.

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).
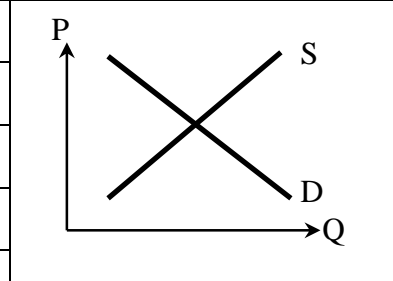
b. Consider the market for **plastic**. Suppose the price of petroleum rises. (Most plastic is made from petroleum.)

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 **grapefruit juice**: Suppose the price of orange juice rises. Suppose that, simultaneously, bad weather kills large numbers of grapefruit trees in Texas and Florida.

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).
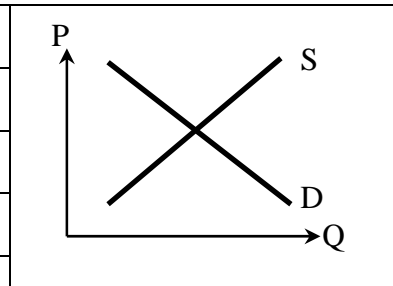
(6) [Welfare effects of international trade: 18 pts] Domestic supply and demand for tee-shirts in a particular country are given by the following diagram.
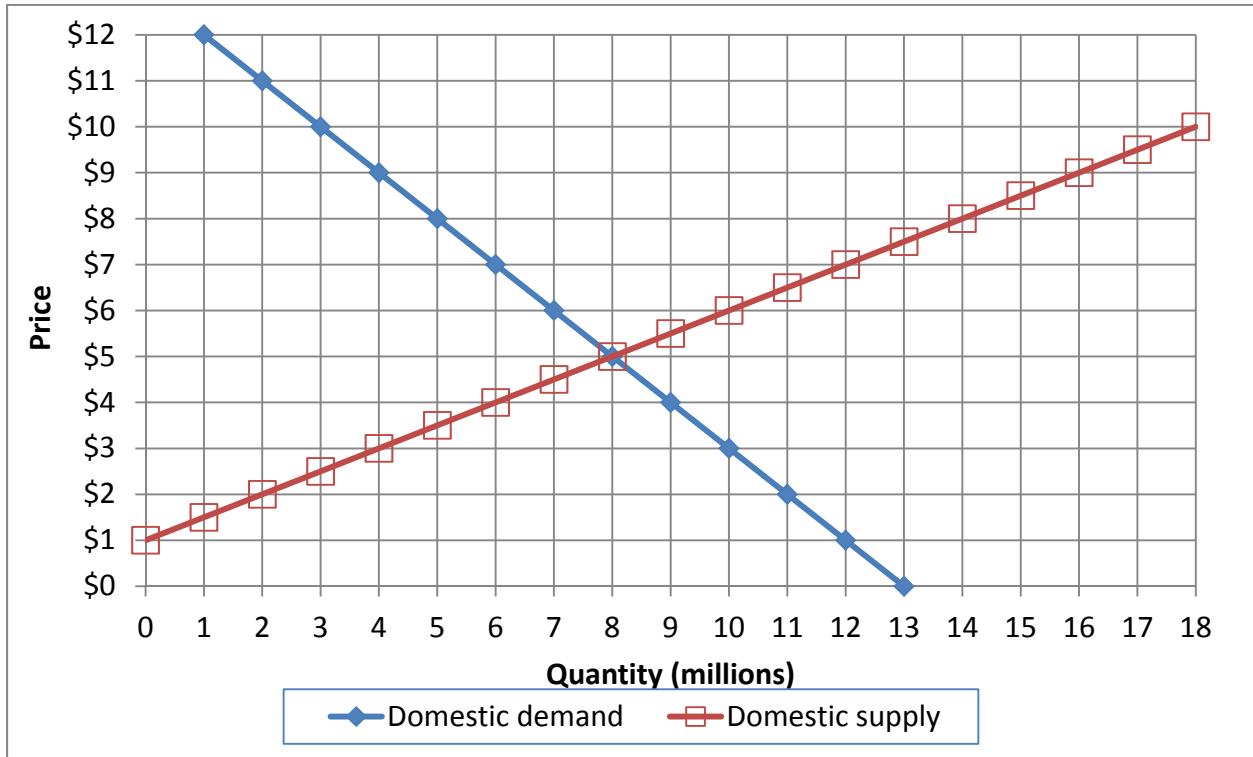
a. At first, international trade in tee-shirts is not permitted. Find the equilibrium price without international trade.

$

Then this industry is opened to international trade and the international price of tee-shirts turns out to be **$ 3.**

b. Will this country now *export* or *import* tee-shirts?

c. How many?

million

d. Does consumer surplus in this country *increase or decrease* from international trade in tee-shirts?

e. By how much?

$ million

f. Does producer surplus in this country *increase or decrease* from international trade in tee-shirts?
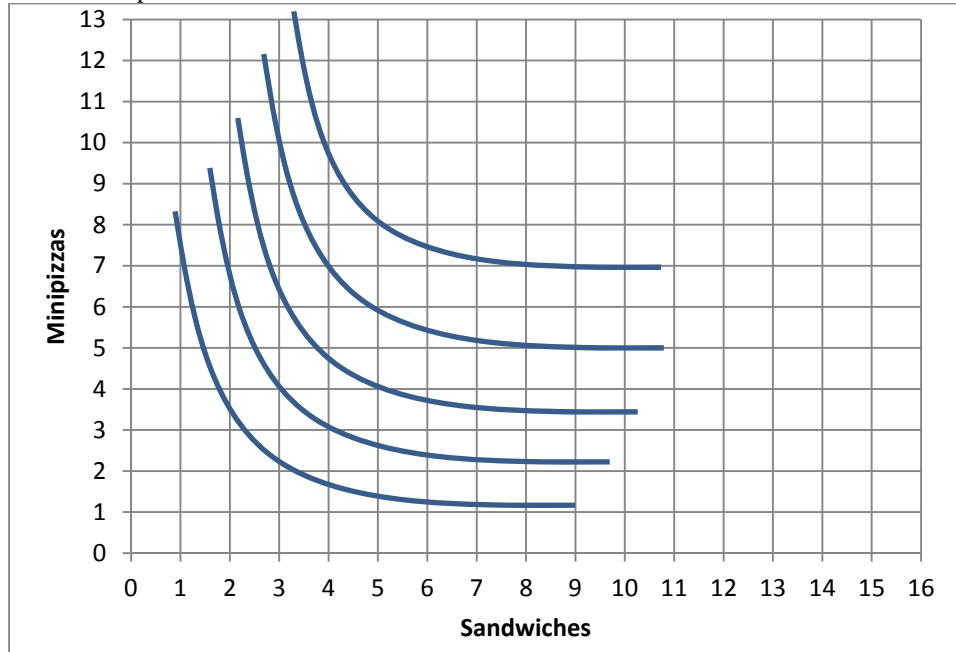
g. By how much?

$ million

h. Does total social welfare in this country *increase or decrease* from international trade in tee-shirts?

i. By how much?

$ million

(7) [Consumer choice and demand: 16 pts]   The indifference curves in the graph below represent Ben's preferences for sandwiches and mini-pizzas.

a. Would Ben rather have 1 sandwich and 8 mini-pizzas, or 3 sandwiches and 4 mini-pizzas?

b. Would Ben rather have 10 sandwiches and 5 mini-pizzas, or 5 sandwiches and 8 mini-pizzas?

| sandwiches	mini-pizzas
and	
sandwiches	mini-pizzas
and	

Suppose Ben has a snack budget of $60 to spend on mini-pizzas and sandwiches. The price of sandwiches is $4.

c. **Using a straightedge**, carefully draw Ben's budget line when the price of mini-pizzas is $5. Label this budget line "A".

d. How many mini-pizzas will Ben buy if the price of mini-pizzas is $5?

mini-pizzas

e. **Using a straightedge**, carefully draw Ben's budget line when the price of mini-pizzas is $10. Label this budget line "B".

f. How many mini-pizzas will Ben buy if the price of mini-pizzas is $10?

mini-pizzas

g. Plot two points on Ben's demand curve for mini-pizzas, and sketch his demand curve at right.
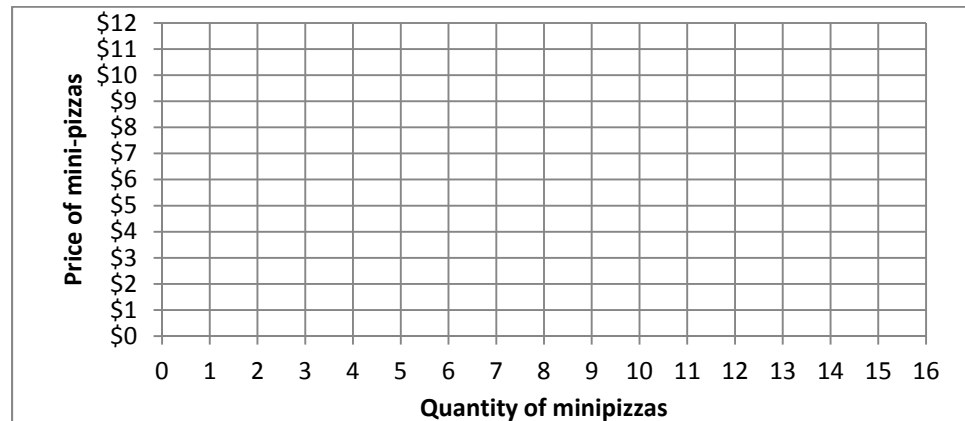
(8) [Short-run cost curves and supply: 20 pts] Acme Illumination Company makes flashlights. It is a small company in a big market, and therefore takes its output price as given. In the short run, the company faces daily cost curves as shown in the following diagram. Here, SMC denotes short-run marginal cost, SAVC denotes short-run average variable cost, and SATC denotes short-run average total cost.
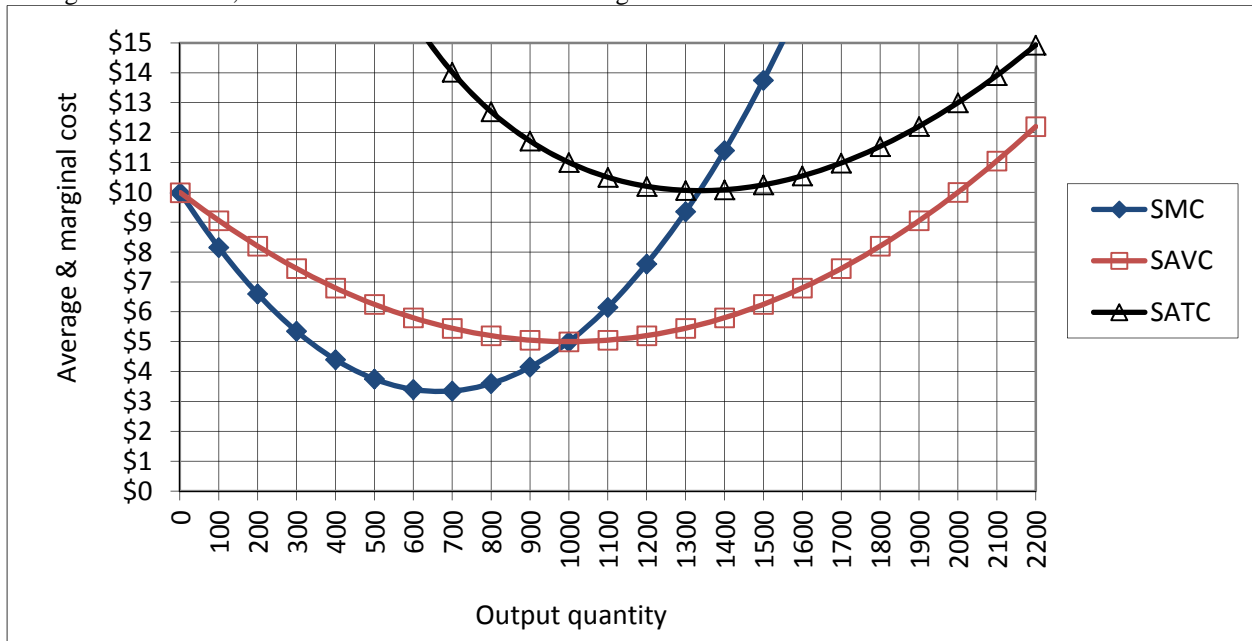
Suppose the company were currently producing 2000 flashlights for some unknown reason.

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 1100 flashlights for some unknown reason. If the company produced one more flashlight, by how much would its total cost increase? That is, what would be the *change in total cost* as the company increased output from 1100 to 1101 flashlights? (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 flashlights is $4. How many flashlights should the company produce? (Give an answer to the nearest hundred.)   _____ flashlights

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

i. Suppose the price of flashlights is $14. How many flashlights should the company produce? (Give an answer to the nearest hundred.)   _____ flashlights
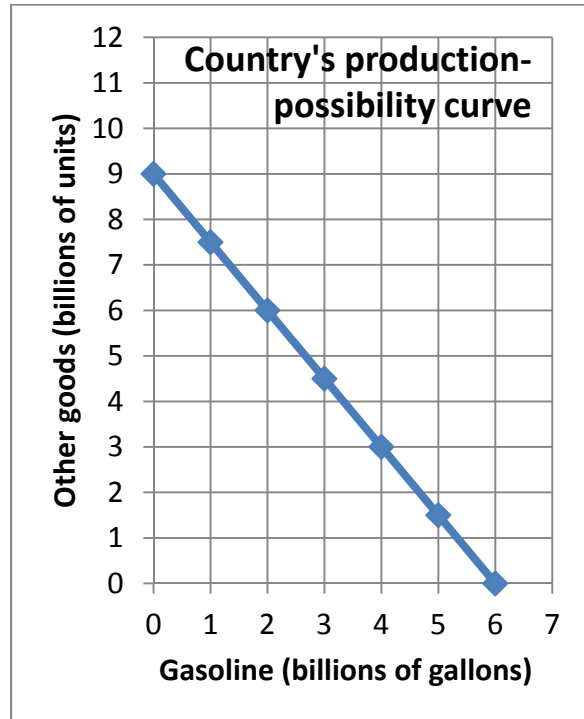
j. Will the company make a *profit* or a *loss* at a price of $14?

(9) [Economy-wide efficiency: 20 pts] The graph at right shows a country's production possibility curve.

a. What is this **country's** opportunity cost of a gallon of gasoline?

units of other goods

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

gallons of gasoline

Assume this country's economy is in competitive equilibrium in all markets and the price of a unit of other goods is $2.
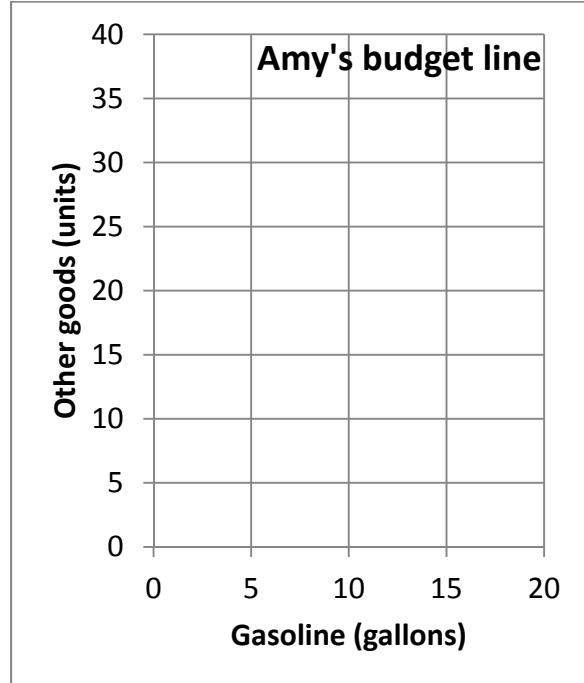
c. What must be the price of a gallon of gasoline?

$

d. What is the marginal cost of producing a unit of other goods?

$

e. What is the marginal cost of producing a gallon of gasoline?

$

Country's production-possibility curve

(graph: vertical axis "Other goods (billions of units)" from 0 to 12; horizontal axis "Gasoline (billions of gallons)" from 0 to 7; straight downward-sloping line from (0,9) to (6,0))

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

f. *Using a straightedge,* draw Amy's budget line in the graph at right.

g. What is the slope of Amy's budget line?

h. What is **Amy's** opportunity cost of a gallon of gasoline?

units of other goods

i. What is **Amy's** opportunity cost of a unit of other goods?

gallons of gasoline

j. What is Amy's marginal rate of substitution of gasoline for other goods—that is, the slope of her indifference curve—at her preferred bundle on this budget line?

Amy's budget line

(graph: vertical axis "Other goods (units)" from 0 to 40; horizontal axis "Gasoline (gallons)" from 0 to 20; empty grid)

(10) [Competition versus collusion: 16 pts] Suppose a small group of firms produce laundry soap. The graph below shows the demand curve for laundry soap, and the joint marginal cost or supply curve of the group of firms.
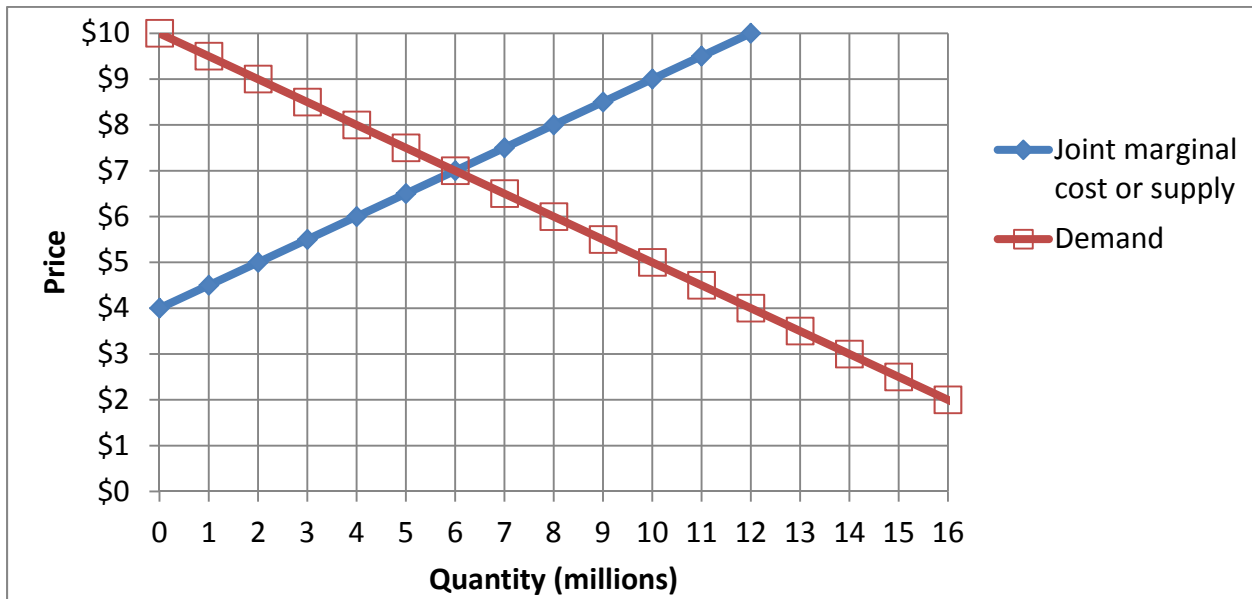
First, assume the firms *compete* with each other, each maximizing its own profit while taking the market price as given.

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 deadweight loss from collusion.	$ million

(11) [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 **3** units per year (a reduction of **2** 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	$100	$400	$700	$600	$200

Command-and-control:
a. To minimize the total cost of cleaning up, which **2** factories should be commanded to clean up? Give their letters.

b. What would be the total cost of cleaning up for these **2** 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 **3** 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.")
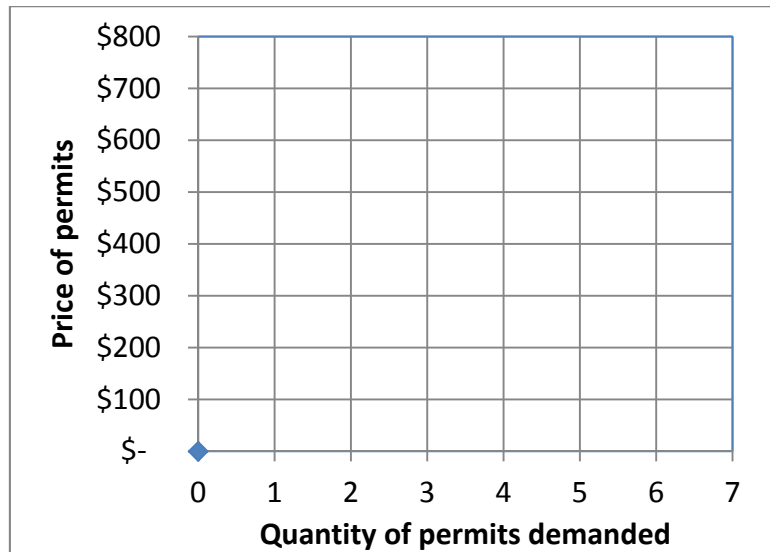
In this auction, the price rises in increments of $100.
d. Which **3** factories would win the permits? Give their letters.

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 **2** 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 **3** units? Give an answer to the nearest hundred dollars. $

h. What would be the total cost of cleaning up for those **2** factories that chose not to pay the fee? $

(12) [Externalities: 12 pts] The graph below shows the market for a particular chemical that generates greenhouse gases, an external cost born by other people. Therefore, in addition to demand and supply curves, a curve representing marginal social cost is shown.
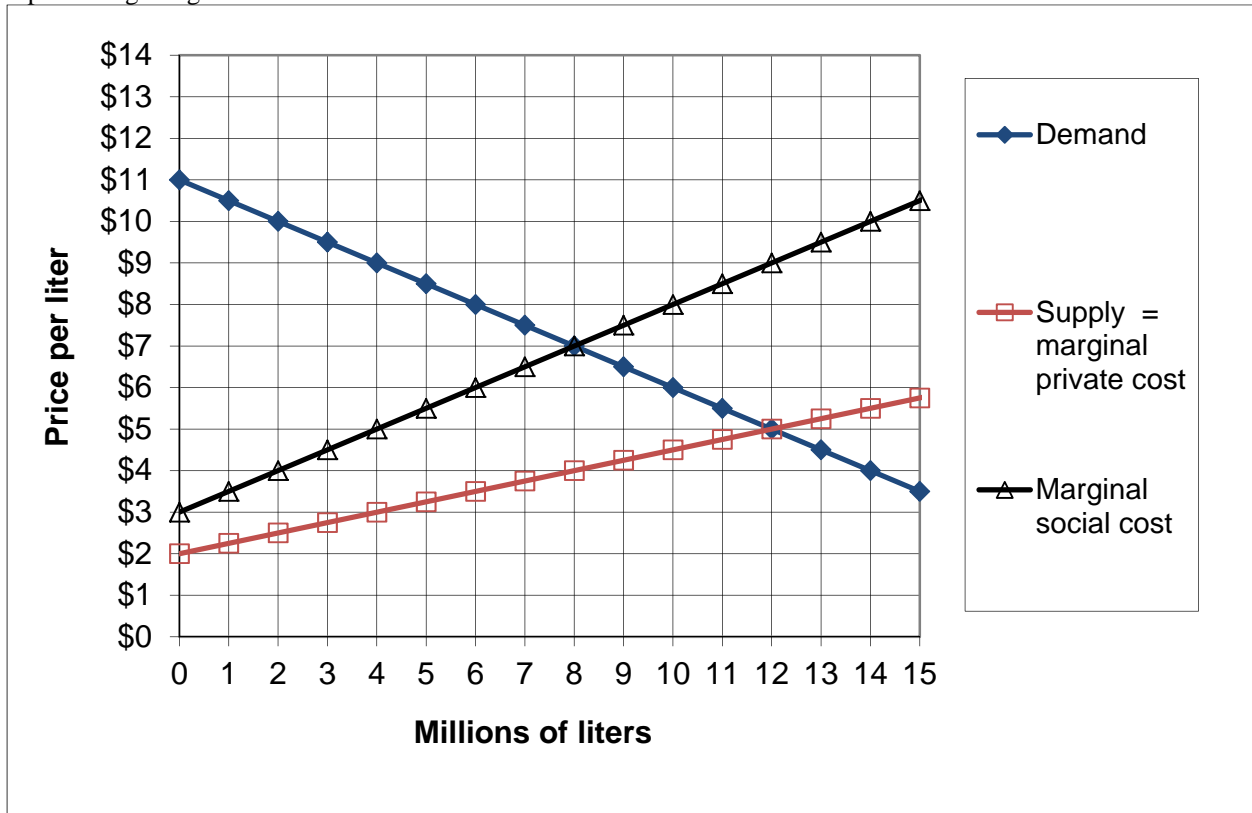
a. Compute the (unregulated) competitive equilibrium price.

b. Compute the (unregulated) competitive equilibrium quantity.

c. Compute the economically efficient (or socially optimal) quantity.

d. Compute the deadweight loss from unregulated competition.

e. To eliminate this deadweight loss, should the government impose a *tax* or a *subsidy*?

f. What should be the tax rate or subsidy rate?

$	per liter
	million liters
	million liters
$	million
$	per liter

(13) [Nonrival goods: 4 pts] Suppose 1000 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: **MB = 32 – 4 Q** .

a. Give an expression (or formula) for the marginal social benefit from the bike trail. [Hint: This must be a formula containing one variable: Q.]

b. Compute Q* the socially-optimal length of the bike trail.

$$MSB =$$

miles

(14) [Common property resources: 6 pts] A certain freeway can easily get congested. This freeway 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 time saved by each new car, and the change in total time saved by all cars, as that new car enters the freeway. Note that the change in total time saved by all cars becomes negative as the freeway becomes congested.
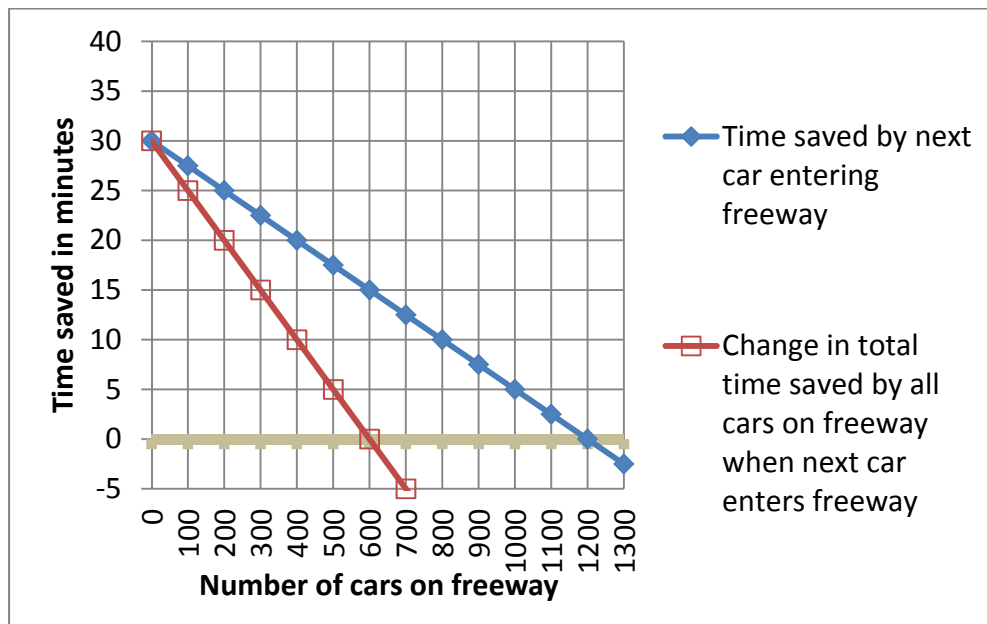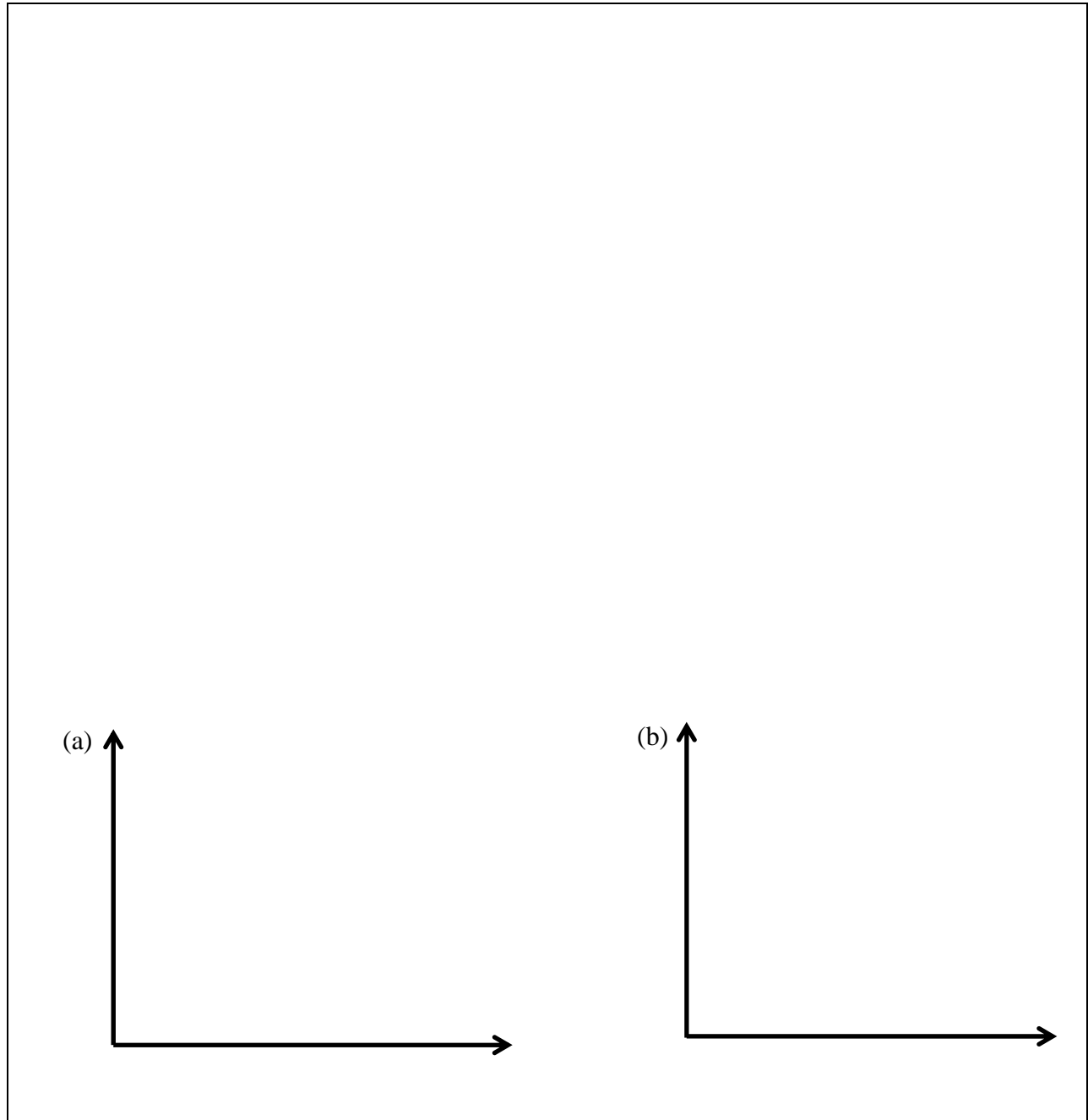

a. How many cars will enter the freeway if entry onto the freeway is unregulated?

cars

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?

cars

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?

$

III. Critical thinking: Write a one-paragraph essay answering the question below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling. [5 pts]

(1) Government can intervene in markets many ways.
a.   Give an example of a government intervention that makes a market *less* efficient. Explain why it decreases efficiency and illustrate your argument using a graph. Label all curves.
b.   Give an example of another government intervention that makes a market *more* efficient. Explain why it increases efficiency and illustrate your argument using a graph. Label all curves.

(a)

(b)

[end of exam]