

FINAL EXAMINATION VERSION C

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators, calculators with alphabetical keyboards, wireless devices and mobile phones 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 write your name and “Version C” on your answer sheet. Then mark the one best answer to each question on the answer sheet. [1 pt each, 35 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 pursuing an activity until the marginal cost of the last unit
- 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) In economics, an *equilibrium* is a situation where
- total costs equal total benefits.
 - no one wants to change their choices.
 - inflation equals zero percent.
 - economic growth is zero.

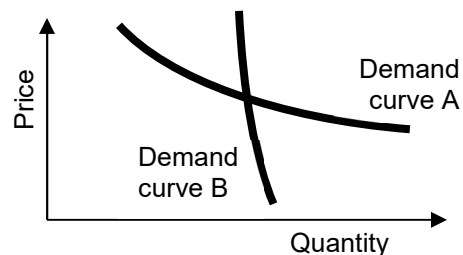
- (4) Economic or physical capital includes
- trucks and bulldozers.
 - machinery and equipment.
 - factories and office buildings.
 - all of the above.
 - none of the above.

- (5) The *law of demand* means that
- consumers have a right to buy whatever they want.
 - the quantity that buyers want to buy is negatively related to the price.
 - demand curves must be straight lines.
 - anything consumers want will be produced.
 - if buyers want something, they will pay whatever price is demanded by sellers.

- (6) A rise in consumers’ income will shift the demand for hotel rooms to the right, because hotel rooms are
- inferior goods.
 - complementary goods.
 - substitute goods.
 - normal goods.

- (7) In February, the price of roses rises and the quantity sold increases. This could be caused by a
- rightward shift in the demand for roses.
 - rightward shift in the supply of roses.
 - leftward shift in the demand for roses.
 - leftward shift in the supply of roses.

- (8) Which demand curve below is *less* 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.



(9) Assuming that train travel and air travel are substitutes, then the cross-price elasticity of demand for train travel with respect to the price of air travel must be

- a. positive
- b. negative.
- c. zero.
- d. cannot be determined from information given.

(10) Assuming that opera tickets are a *superior* or *luxury good*, the income elasticity of demand for opera tickets must be

- a. negative.
- b. exactly zero.
- c. between zero and one.
- d. exactly one.
- e. greater than one.

(11) Suppose there is a change in government policy affecting agriculture. Which of the following outcomes would be a *Pareto improvement*?

- a. Producers gain \$20 billion while consumers lose \$10 billion.
- b. Producers gain \$10 billion while consumers lose \$20 billion.
- c. Producers gain \$10 billion while consumers are unaffected.
- d. Both (a) and (c).
- e. All of the above.

(12) 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

- a. \$2.
- b. \$5.
- c. \$6.
- d. \$9.

(13) Which of the following government controls on a competitive market cause the quantity traded to *increase*?

- a. price floor (legal minimum price).
- b. price ceiling (legal maximum price).
- c. quota (or legal maximum quantity) on buyers.
- d. all of the above.
- e. none of the above.

(14) 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,

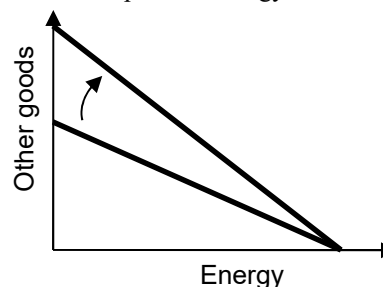
- a. sellers (hotel operators) will pay most of the tax.
- b. buyers (guests) will pay most of the tax.
- c. sellers and buyers will each pay half of the tax.
- d. Answer depends on which side is legally required to remit the tax to the government.

(15) A change in the quantity of organic vegetables each person buys is called a change at the

- a. extensive margin.
- b. intensive margin.
- c. marginal product.
- d. marginal revenue.

(16) In the graph below, the rotation in the budget line could be caused by

- a. an increase in income.
- b. a decrease in income.
- c. a decrease in the price of other goods.
- d. an increase in the price of other goods.
- e. a decrease in the price of energy.



(17) A firm's total cost divided by its total output by definition equals the firm's

- a. total revenue.
- b. marginal revenue.
- c. total cost.
- d. average cost.
- e. marginal cost.

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

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

(19) A cost that you cannot avoid no matter what action you take is called

- a. an opportunity cost.
- b. a marginal cost.
- c. a variable cost.
- d. a sunk cost.
- e. an average cost.

(20) The formula for discounting shows that the present discounted value of a payment to be received in the future is *smaller*

- a. the longer the wait until the payment is received.
- b. the shorter the wait until the payment is received.
- c. Present discounted value is not affected by the time until payment.
- d. Cannot be determined from the information given.

(21) *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.

(22) If consumers view the products of different firms as *perfect substitutes*, they will

- a. buy some of each.
- b. choose whichever is cheaper.
- c. stay with their current brand, even if it is a little more expensive.
- d. flip a coin to decide which brand to buy.

(23) Firms X and Y both produce motor oil, but for some unknown reason, Firm X's marginal cost is \$2 and Firm Y's marginal cost is \$5. If one quart of output is shifted from Firm X to Firm Y, then total industry costs will

- a. increase by \$2.
- b. increase by \$3.
- c. increase by \$5.
- d. decrease by \$2.
- e. decrease by \$7.

(24) Suppose the price of a mobile phone is \$400 and the price of a computer is \$1600. If the economy is perfectly competitive, then these prices indicate that the *economy's* opportunity cost of a phone is

- a. 1/4 of a computer.
- b. 1/2 of a computer.
- c. 1 computer.
- d. 2 computers.
- e. 4 computers.

(25) An industry is a natural monopoly if

- a. the industry became a monopoly without government interference.
- b. the only seller in the market sells a natural or "green" product.
- c. one firm owns all the key natural resources required to produce the product.
- d. each firm's average cost curve slopes down.

(26) Suppose a coffee shop sells 10 cups of specialty coffee if the price is \$3, and sells 11 cups of the same coffee if the price is \$2.95. The shop's marginal revenue of the 11th cup is therefore

- a. \$0.05 .
- b. \$1.95 .
- c. \$2.45 .
- d. \$2.95 .
- e. \$3.00 .

(27) 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.

(28) Products are said to be "differentiated" if

- a. one can buy them in fractional amounts.
- b. consumers do not view them as perfect substitutes.
- c. they are sold through different retail channels (stores, online, catalogs, etc.)
- d. different consumers buy different quantities of them.

(29) 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.

(30) Suppose a large city park is spacious and never crowded, so one person using the park does not interfere with others using it. Moreover, the city has no way to charge admission to the park. Therefore the park is

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

(31) Taco Bell requires you to pay for a burrito before you eat it. Only one person can eat the burrito, of course. So a burrito from Taco Bell is

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

(32) 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.

(33) Suppose the marginal private cost of producing a ton of coal is \$40 and the marginal social cost is \$60. Then the marginal external cost is

- a. \$20.
- b. \$40.
- c. \$60.
- d. \$100.
- e. \$2,400.

(34) Unlike other taxes, a pollution tax

- a. generates no revenue for the government.
- b. affects only producers.
- c. causes deadweight loss.
- d. increases economic efficiency.

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

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

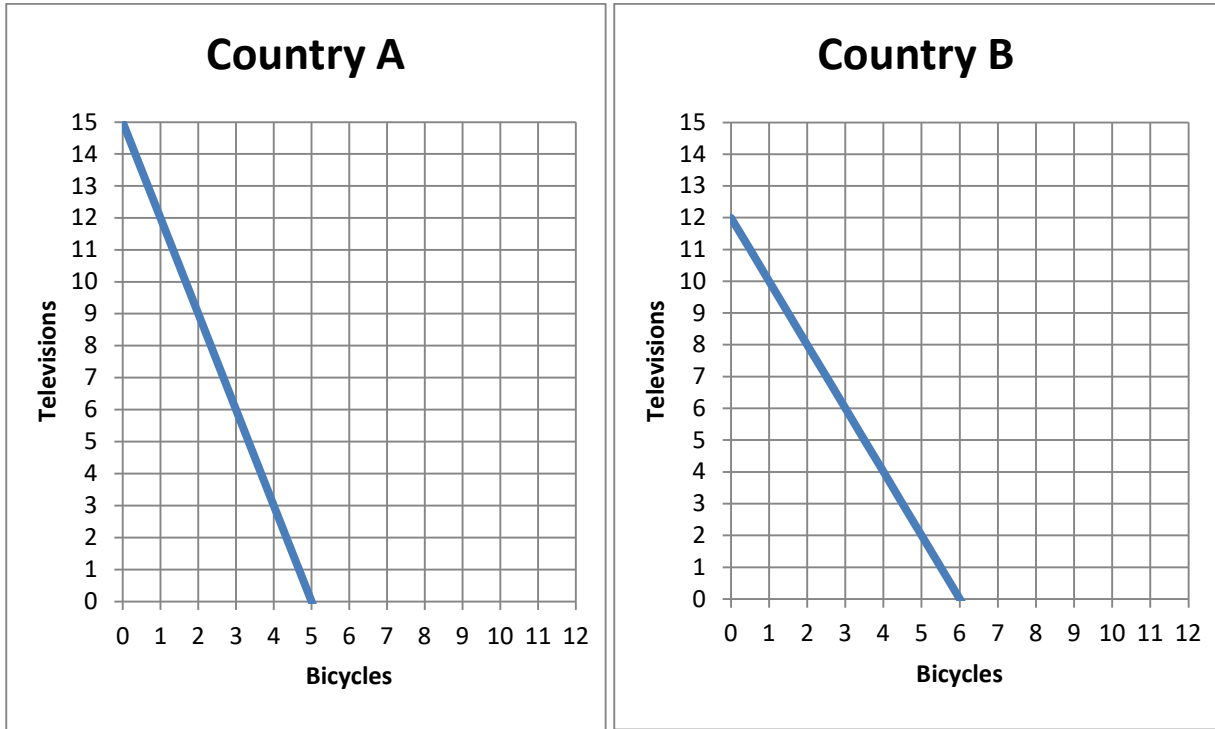
II. Problems: Insert your answer to each question in the box provided. Use margins and graphs for scratch work. Only the answers in the boxes will be graded. Work carefully—partial credit is not normally given for questions in this section.

(1) [Using price elasticity of demand: 10 pts] Suppose the electric utility *raises* its price by 5%. Suppose the price elasticity of demand for electricity is -0.8. Assume everything else affecting demand for electricity remains constant.

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

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| |
| % |

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



- What is Country A's opportunity cost of producing a television?
- What is Country B's opportunity cost of producing a television?
- What is Country A's opportunity cost of producing a bicycle?
- What is Country B's opportunity cost of producing a bicycle?
- Which country has a comparative advantage in producing televisions?
- Which country has a comparative advantage in producing bicycles?

| | |
|--|-------------|
| | bicycles |
| | bicycles |
| | televisions |
| | televisions |
| | |
| | |

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 _____ televisions 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**.

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

a. Consider the market for **natural gas**. Suppose we have an unusually cold winter. (Most homes in the Midwest are heated with natural gas.)

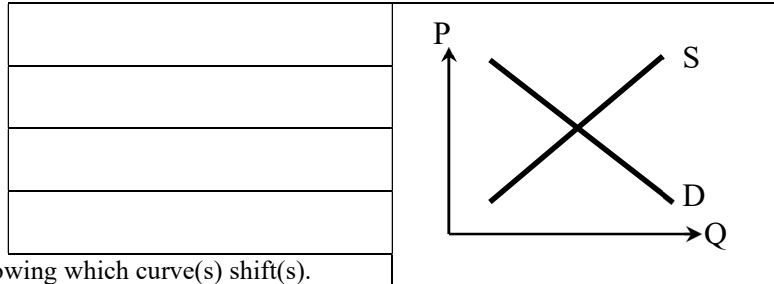
Does demand shift *left*, shift *right*, or remain *unchanged* ?

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 **new houses**: A construction workers' union wins a big wage increase.

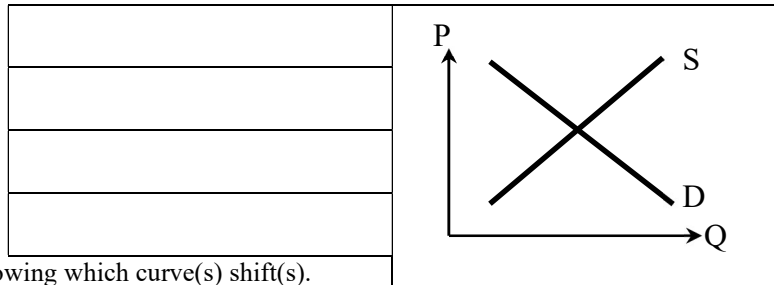
Does demand shift *left*, shift *right*, or remain *unchanged* ?

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 **airline tickets**: The price of jet fuel rises. At the same time, a recession lowers consumers' incomes.

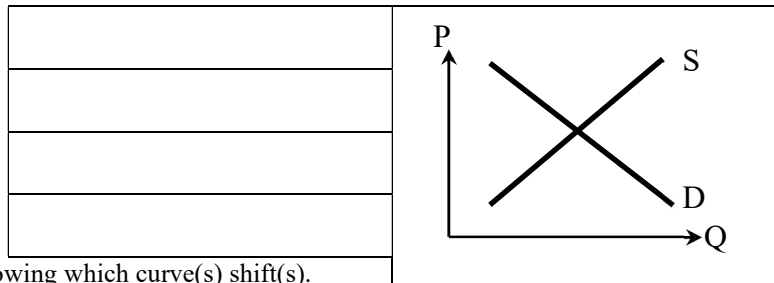
Does demand shift *left*, shift *right*, or remain *unchanged* ?

Does supply shift *left*, shift *right*, or remain *unchanged* ?

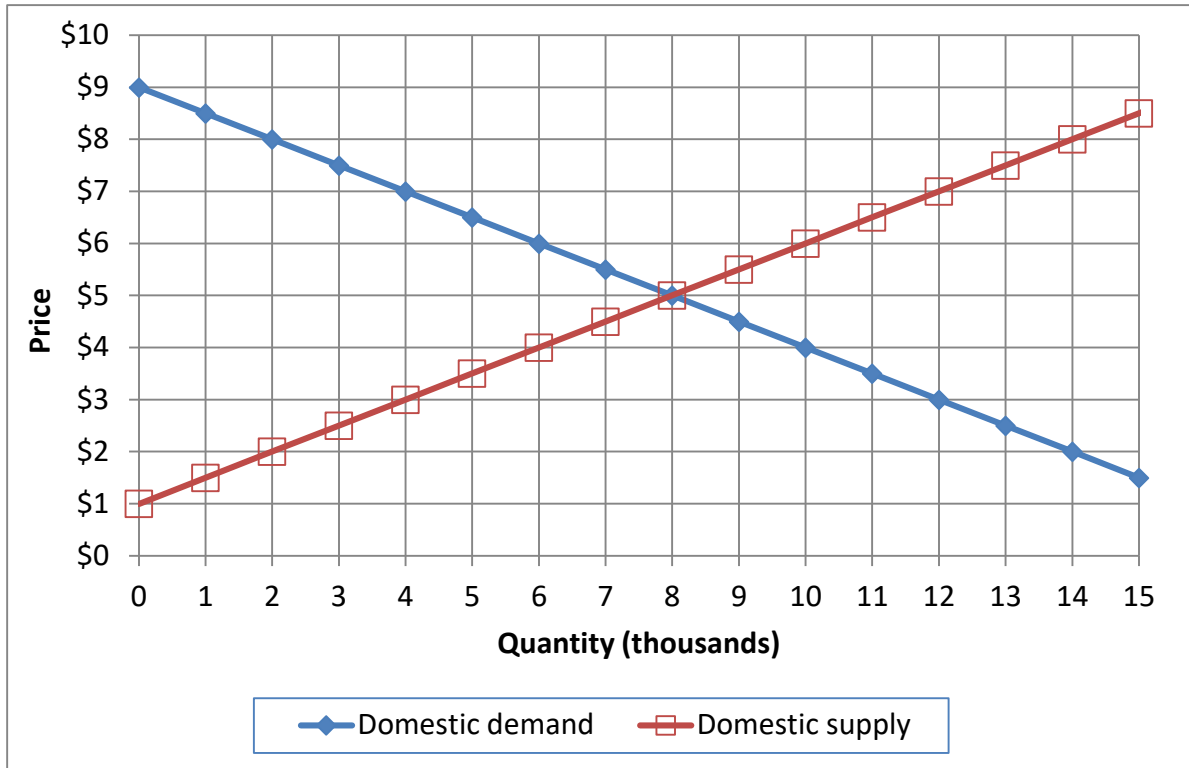
Does the equilibrium price *increase*, *decrease*, or *cannot be determined* ?

Does the equilibrium quantity *increase*, *decrease*, or *cannot be determined* ?

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



(4) [Welfare analysis of international trade: 18 pts] Domestic supply and demand for ball caps in a particular country are given by the following diagram.



a. At first, international trade in ball caps is not permitted. Find the equilibrium price without international trade.

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| \$ | |
|----|--|

Then this industry is opened to international trade and the international price of ball caps turns out to be \$ 3.

b. Will this country now *export* or *import* ball caps?

c. How many?

d. Does consumer surplus in this country *increase or decrease* from international trade in ball caps?

e. By how much?

f. Does producer surplus in this country *increase or decrease* from international trade in ball caps?

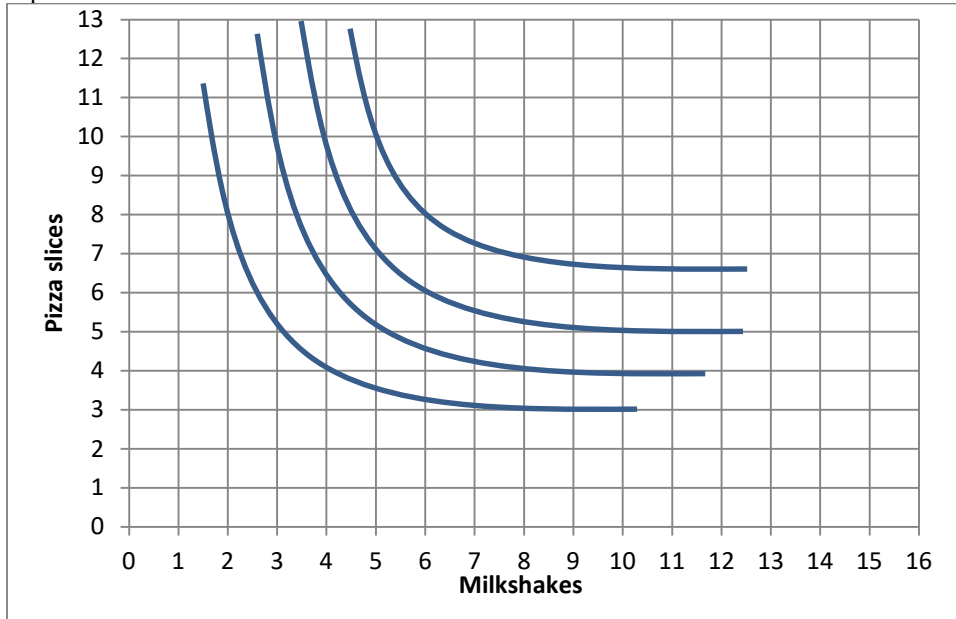
g. By how much?

h. Does total social welfare in this country *increase or decrease* from international trade in ball caps?

i. By how much?

| | |
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| | thousand |
| | thousand |
| | thousand |
| | thousand |

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



- a. Would Jennifer rather have 7 pizza slices and 5 milkshakes, or 4 pizza slices and 11 milkshakes?
- b. Would Jennifer rather have 10 pizza slices and 3 milkshakes, or 6 pizza slices and 6 milkshakes?

| | |
|-----------------------------------|------------|
| pizza slices and milkshakes | milkshakes |
| pizza slices and milkshakes | milkshakes |

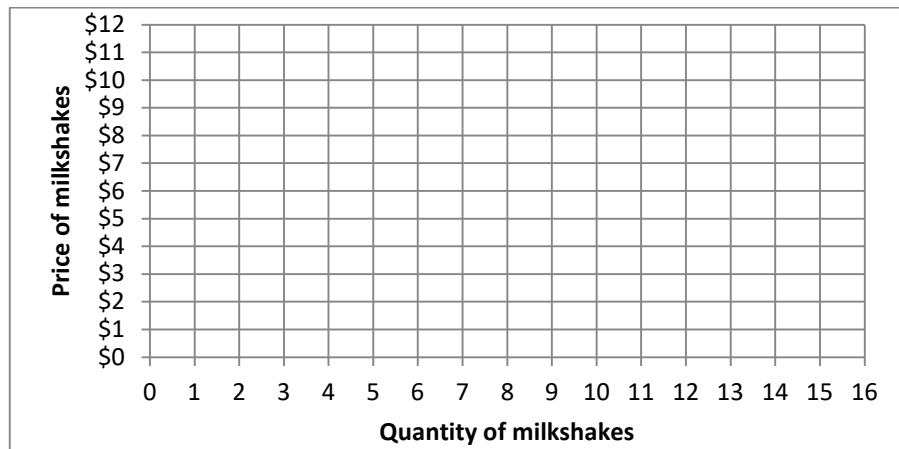
Suppose Jennifer has a budget of \$60 to spend on pizza and milkshakes. The price of pizza slices is \$6.

- c. **Using a straightedge**, carefully draw Jennifer’s budget line when the price of milkshakes is \$4. Label this budget line “A”.
- d. How many milkshakes will Jennifer buy if the price of milkshakes is \$4?
- e. **Using a straightedge**, carefully draw Jennifer’s budget line when the price of milkshakes is \$10. Label this budget line “B”.
- f. How many milkshakes will Jennifer buy if the price of milkshakes is \$10?

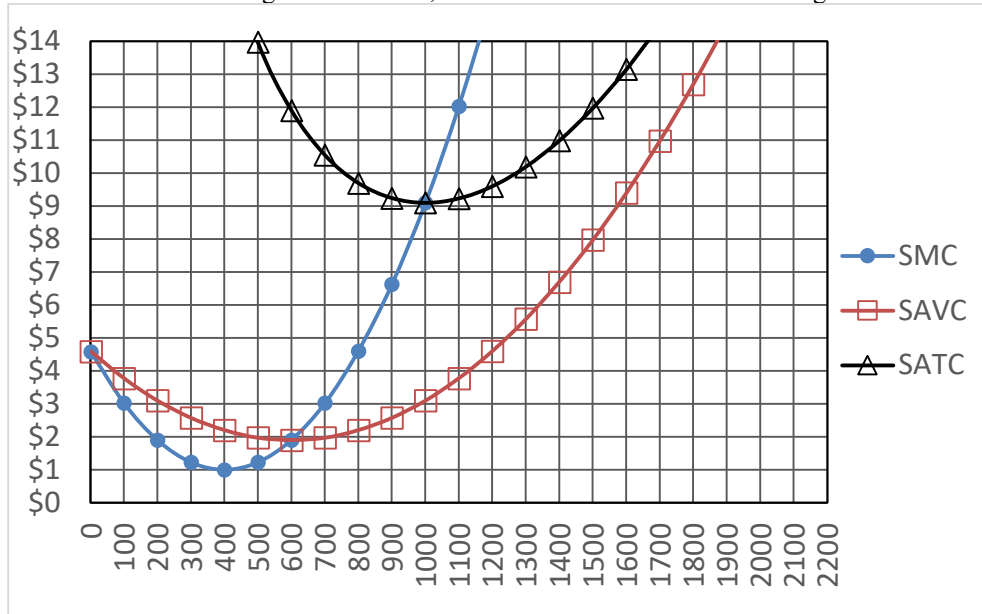
| |
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| milkshakes |
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| |
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| milkshakes |
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- g. Plot two points on Jennifer’s demand curve for milkshakes, and sketch Jennifer’s demand curve at right.



(6) [Short-run cost curves and supply: 20 pts] ABC Manufacturing Company makes a small part used in automobiles. ABC 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 1500 parts for some unknown reason.

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

| | |
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| \$ | thousand |
| \$ | thousand |
| \$ | thousand |

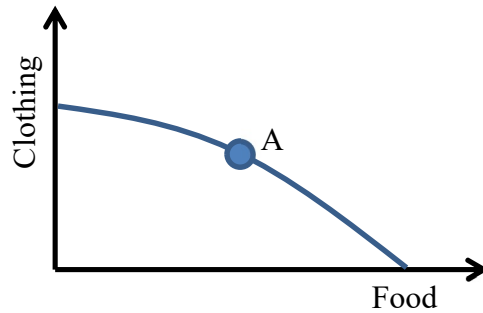
- d. Suppose the company were currently producing 200 parts for some unknown reason. If the company produced one more part, by how much would its total cost increase? That is, what would be the *change in total cost* as the company increased output from 200 to 201 parts? (Give an answer to the nearest dollar.)

| |
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| \$ |
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- 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 \$3. 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 \$3?
- i. Suppose the price of parts is \$12. 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 \$12?

| | |
|----|-------|
| \$ | |
| \$ | |
| | parts |
| | |
| | parts |
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(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 $-1/3$.



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

| |
|-------------------|
| units of clothing |
| units of food |

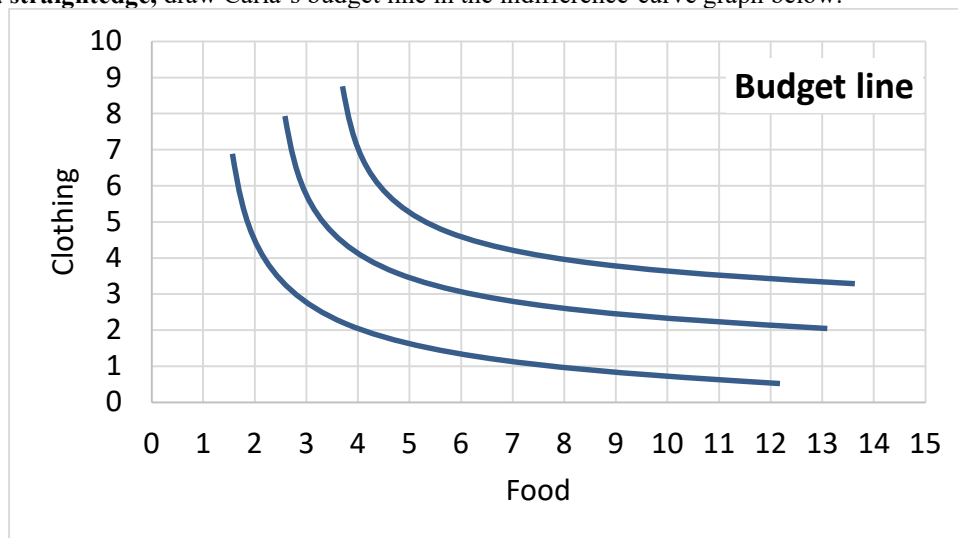
Assume this country's economy is in competitive equilibrium in all markets and the price of a unit of clothing is \$6.

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

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Carla is a consumer in this economy. She has an income of \$30.

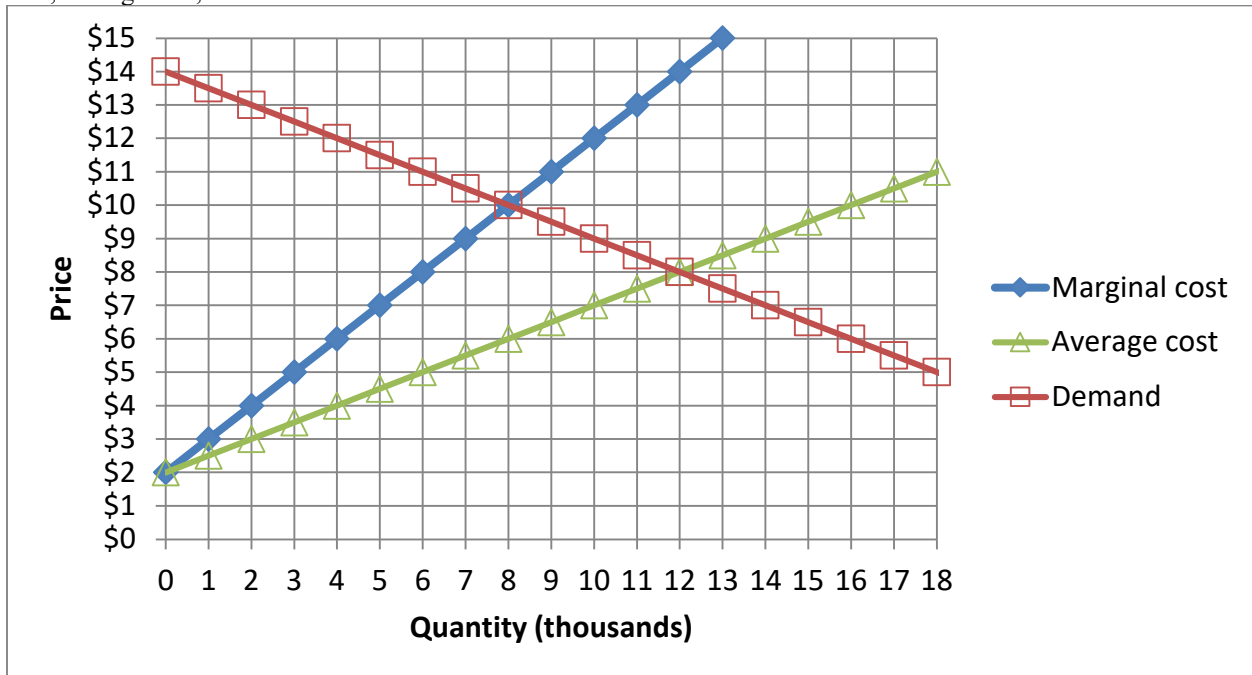
- d. Using a straightedge, draw Carla's budget line in the indifference-curve graph below.



- e. What is **Carla's** opportunity cost of a unit of food?
- f. What is **Carla's** opportunity cost of a unit of clothing?
- g. How many units of clothing will Carla choose to purchase?
- h. At **Carla's** chosen bundle, what is her marginal rate of substitution—that is, the slope of her indifference curve? (Give a number.)

| |
|-------------------|
| units of clothing |
| units of food |
| units of clothing |
| |

(8) [Monopoly: 12 pts] Winterland is the only ice rink in the county, so it enjoys a local monopoly. Its marginal cost, average cost, and demand curves are shown below.



Assume that Winterland must charge the same price on every admission sold.

- Using a straightedge, draw and label Winterland's marginal revenue curve.
- Compute Winterland's profit-maximizing quantity.
- Compute the price that Winterland would charge.
- Compute Winterland's profits.
- Compute consumer surplus
- Compute the social deadweight loss.

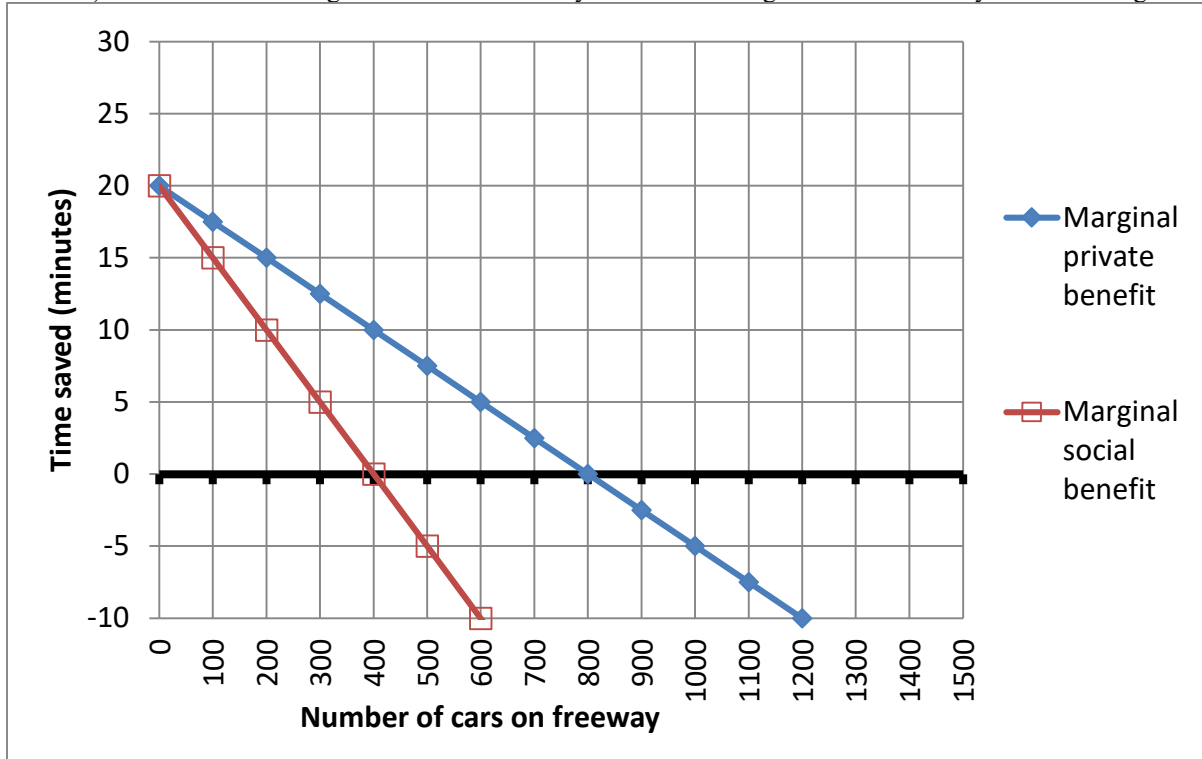
| | |
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| | thousand |
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| \$ | thousand |
| \$ | thousand |
| \$ | thousand |

(9) [Nonrival goods: 6 pts] A city government will offer a free outdoor concert series during the summer in a neighborhood park. About **2000** people are likely to enjoy the concerts. Each concert costs **\$4000** to produce. Let Q denote the number of concerts. A typical individual person's marginal benefit from the concert series is given by the following expression: $MB = 10 - 2Q$.

- How many concerts would a typical *individual* pay for, for their private enjoyment?
- Give an expression for the marginal social benefit from the concert series. [Hint: This must be a formula containing one variable: Q .]
- Compute Q^* the socially-optimal number of concerts.

| | |
|-------|----------|
| | concerts |
| MSB = | |
| | concerts |

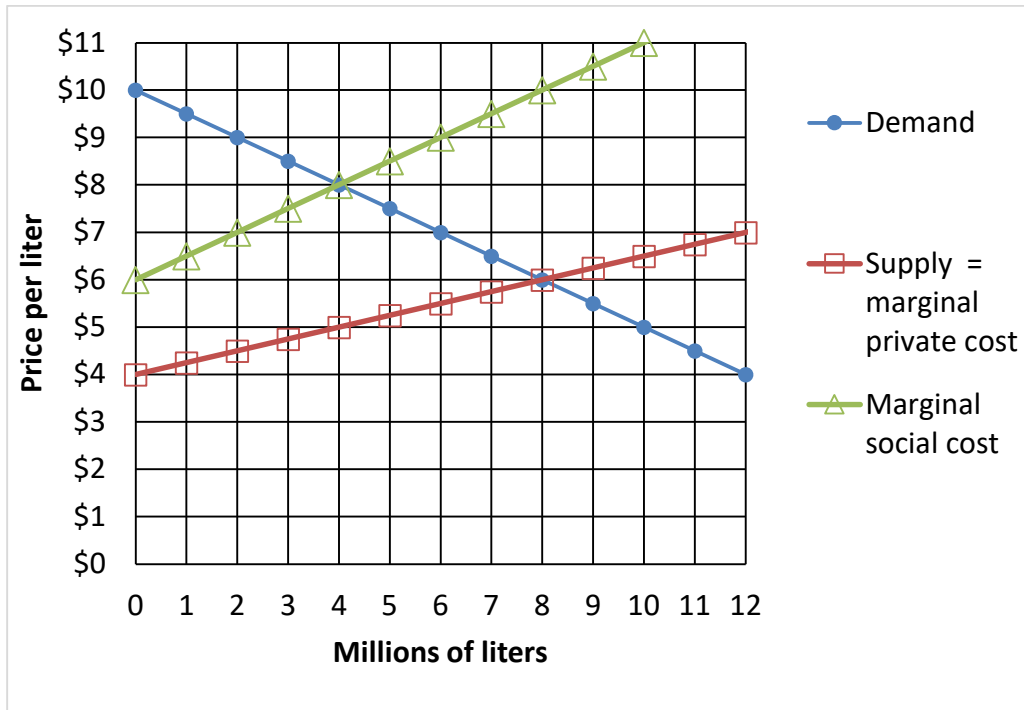
(10) [Common property resources: 6 pts] A certain freeway can easily become congested. It is the quickest route to downtown, but during rush hour, when one car enters the freeway, all the cars already on the freeway slow down a bit. The graph below shows the average time saved by each car when it enters 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.



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



- 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*?
- What should be the tax rate or subsidy rate?

| | |
|----|----------------|
| \$ | per liter |
| | million liters |
| | million liters |
| \$ | million |
| | |
| \$ | per liter |

(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 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 | \$5 | \$35 | \$25 | \$45 | \$15 |

Command-and-control:

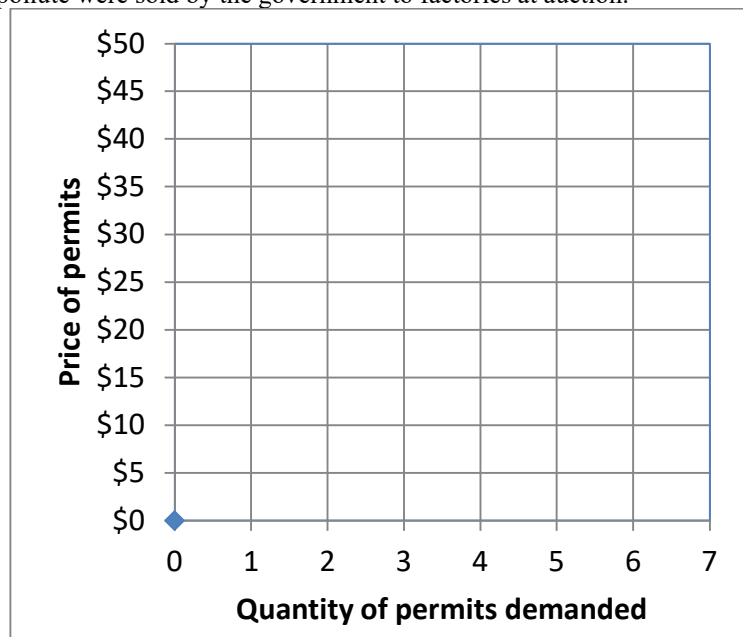
- a. To minimize the total cost of cleaning up, which 2 factories should be commanded to clean up? Give their letters.
- b. What would be the total cost of cleaning up for these 2 factories together?

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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 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 starts at \$0 and rises in increments of \$10.

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

| |
|----|
| \$ |
| \$ |

[end of exam]