

FINAL EXAMINATION VERSION A

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 A" on your answer sheet. Then mark the one best answer to each question on the answer sheet. [1 pt each, 35 pts total]

(1) The assumption in economics that people are *rational* implies that people

- a. ignore "soft" concerns like friendships and charity.
- b. do the best they can with what they have.
- c. make sacrifices today for a better future.
- d. maximize their income.
- e. use math to make decisions.

(2) Rational choice implies pursuing an activity until the marginal benefit of the last unit

- a. begins to fall below its marginal cost.
- b. is much less than its marginal cost.
- c. is much greater than its marginal cost.
- d. begins to exceed its marginal cost.

(3) In economics, an *equilibrium* is a situation where

- a. economic growth is zero.
- b. total costs equal total benefits.
- c. no one wants to change their choices.
- d. inflation equals zero percent.

(4) Economic or physical capital includes

- a. shares of stock in public corporations.
- b. trucks and machines.
- c. mortgage-backed securities.
- d. bank accounts.
- e. all of the above.

(5) The *law of demand* means that

- a. if buyers want something, they will pay whatever price is demanded by sellers.
- b. consumers have a right to buy whatever they want.
- c. the quantity that buyers want to buy is negatively related to the price.
- d. demand curves must be straight lines.
- e. anything consumers want will be produced.

(6) As consumers' incomes rise, they typically go to more music concerts, because concerts are

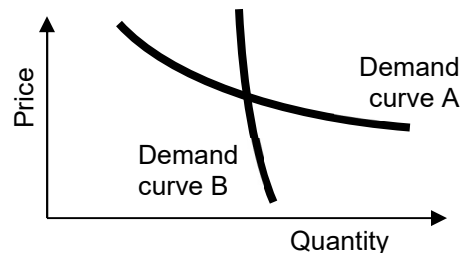
- a. a substitute good.
- b. a complementary good.
- c. an inferior good.
- d. a normal good.

(7) In September, the price of pears decreases and the quantity sold increases. This could be caused by a

- a. rightward shift in the demand for pears.
- b. rightward shift in the supply of pears.
- c. leftward shift in the demand for pears.
- d. leftward shift in the supply of pears.

(8) 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.



(9) Assuming that hotel rooms and air travel are complements, then the cross-price elasticity of demand for hotel rooms 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 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.

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

- a. Producers gain \$1 billion while consumers lose \$2 billion.
- b. Producers gain \$1 billion while consumers are unaffected.
- c. Producers gain \$2 billion while consumers lose \$1 billion.
- d. Both (b) and (c).
- e. All of the above.

(12) 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 watermelons in Des Moines is

- a. \$1.
- b. \$4.
- c. \$8.
- d. \$10.

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

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

(14) 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,

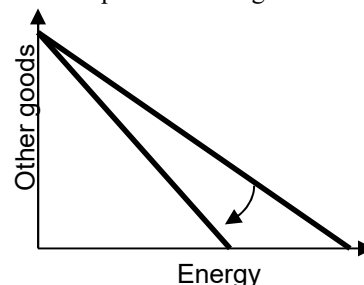
- a. sellers (landlords) will pay most of the tax.
- b. buyers (renters) will pay most of the tax.
- c. sellers and buyers will each pay half of the tax.
- d. Answer depends on which side is legally required to remit the tax to the government.

(15) A change in the number of people who buy organic vegetables 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 of the budget line could be caused by

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



(17) The increase in a firm's total revenue from producing and selling one more unit of 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. 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.

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

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

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

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

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

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

(23) Firms X and Y both produce motor oil, but for some unknown reason, Firm X's marginal cost is \$3 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 \$8.

(24) Suppose the price of a mobile phone is \$400 and the price of a computer is \$800. If the economy is perfectly competitive, then these prices indicate that the *economy's* opportunity cost of a computer is

- a. 1/4 of a phone.
- b. 1/2 of a phone.
- c. 1 phone.
- d. 2 phones.
- e. 4 phones.

(25) An industry is a natural monopoly if

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

(26) Suppose a sandwich stand sells 10 sandwiches per hour if the price is \$5, and sells 11 sandwiches if the price is lowered to \$4.75. The stand's marginal revenue of the 11th sandwich is therefore

- a. \$0.25 .
- b. \$2.25 .
- c. \$2.50 .
- d. \$4.75 .
- e. \$5.00 .

(27) The Cournot model of oligopoly predicts that as the number of firms increases in an industry, the market price

- a. remains constant.
- b. approaches zero.
- c. approaches marginal cost.
- d. approaches the monopoly price.

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

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

(29) The electric company monitors each customer's usage and bills for it. If a customer does not pay, the customer's electric power is turned off. Now electric power that flows to one customer cannot flow to another customer. Electric power is therefore

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

(30) In the western United States, water is scarce. Suppose no one can be prevented from taking water from a particular stream. Unfortunately, if any person takes water, there is less for others. Water from this stream is therefore

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

(31) The Des Moines Art Museum is spacious enough that it can accommodate many visitors without crowding. However, it *can* charge admission—and sometimes does so for special events. The Museum is thus

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

(32) If you gaze at the moon, other people can do so at the same time, and no one can make you pay for it. A view of the moon is therefore

- 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 \$100. Then the marginal external cost is

- a. \$40.
- b. \$60.
- c. \$100.
- d. \$140.
- e. \$4,000.

(34) Unlike other taxes, a pollution tax

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

(35) 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.

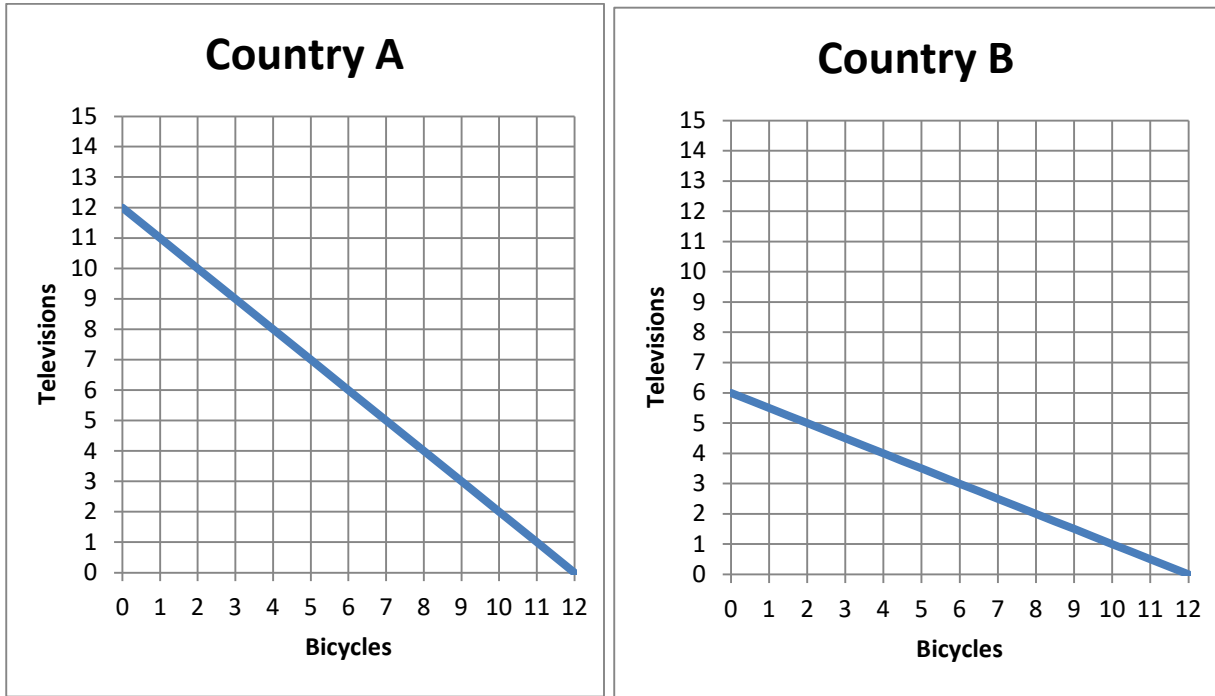
II. Problems: Insert your answer to each question in the box provided. Use margins and graphs for scratch work. Only the answers in the boxes will be graded. Work carefully—partial credit is not normally given for questions in this section.

(1) [Using price elasticity of demand: 10 pts] Suppose the water utility *lowers* its price by 10%. Suppose the price elasticity of demand for water is -0.6. 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 falls, 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 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 **gasoline**. Suppose new government environmental regulations raise the cost of producing gasoline.

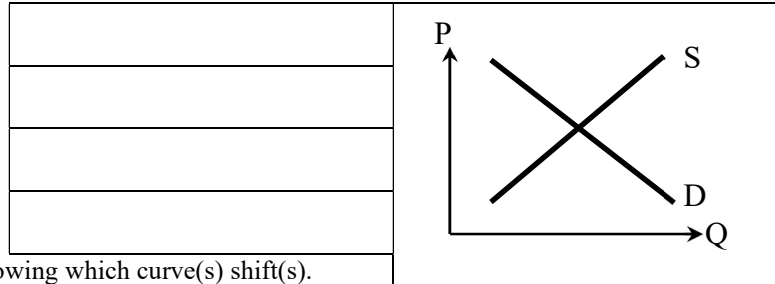
Does demand shift *left*, shift *right*, or remain *unchanged* ?

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 **hotel rooms**: Suppose a recession lowers consumers' incomes.

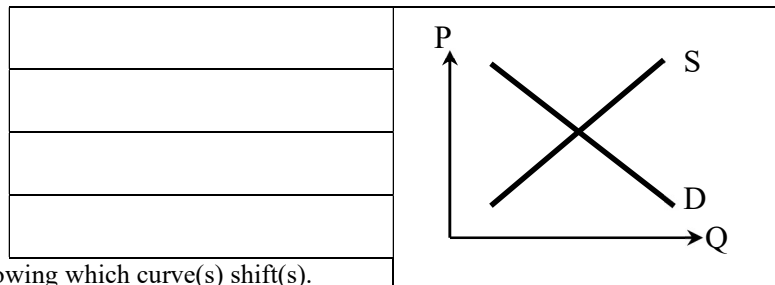
Does demand shift *left*, shift *right*, or remain *unchanged* ?

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).



c. Consider the market for **polyester clothing**: A change in consumer tastes favors natural fibers. At the same time, the price of polyester fabric rises. (Note: polyester is a synthetic fiber made from petroleum.)

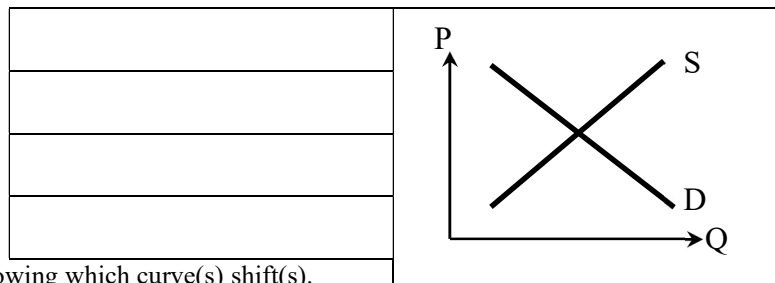
Does demand shift *left*, shift *right*, or remain *unchanged* ?

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

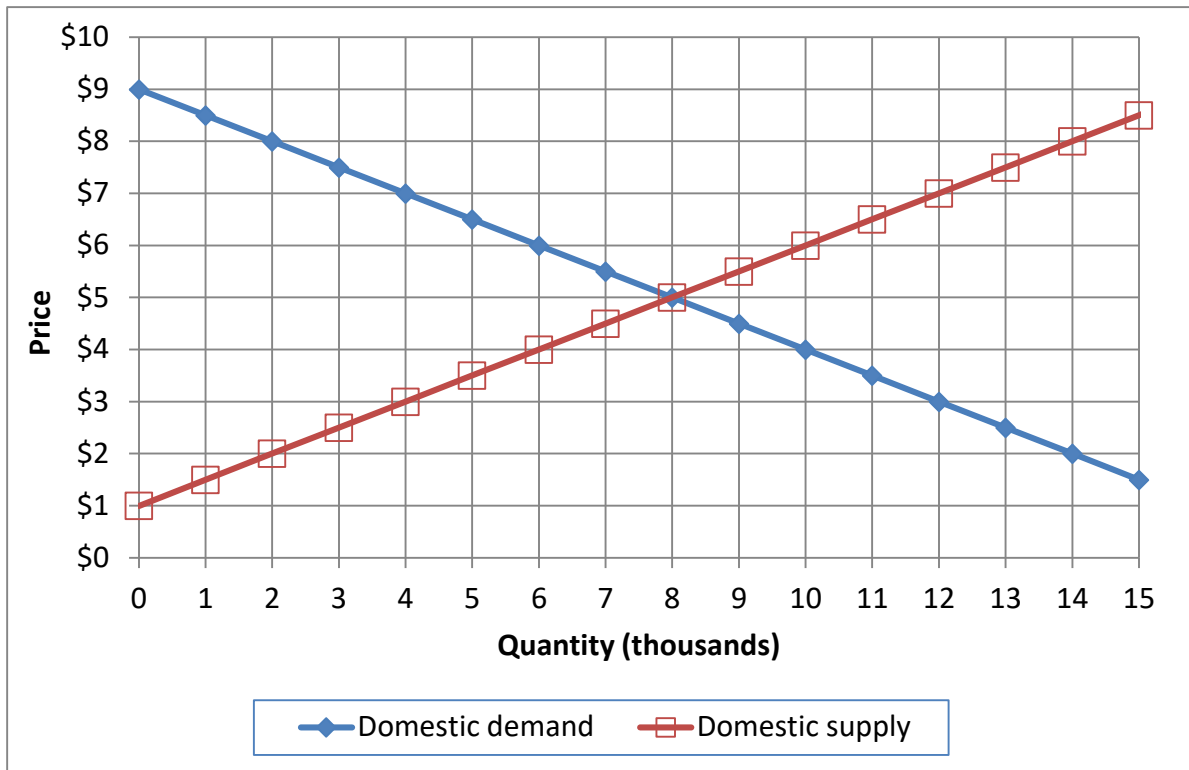
Does the equilibrium price *increase*, *decrease*, or *cannot be determined* ?

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

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



(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 \$ 7.

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?

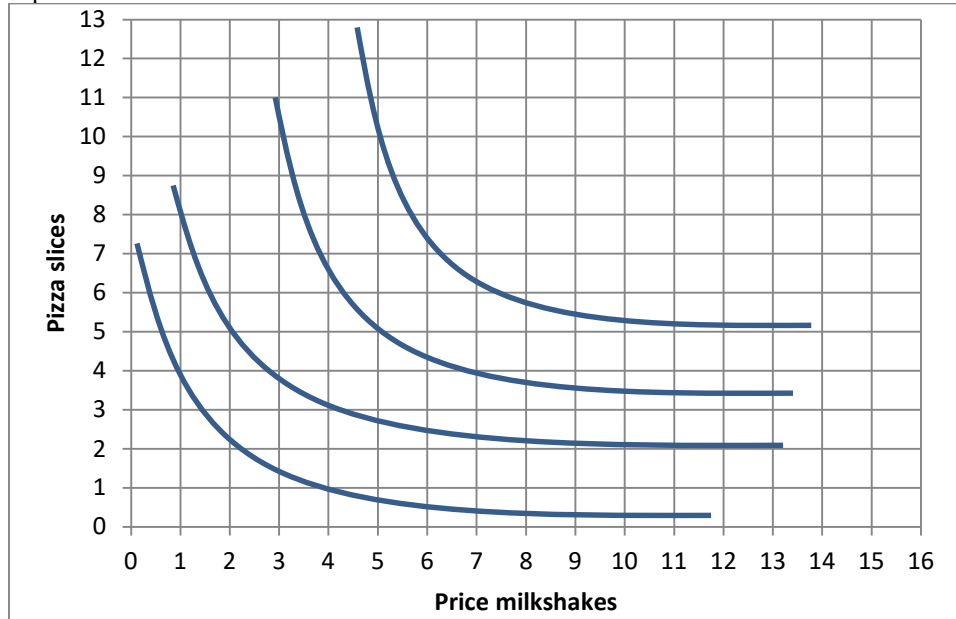
g. By how much?

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

i. By how much?

	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 10 pizza slices and 3 milkshakes, or 2 pizza slices and 12 milkshakes?
- b. Would Jennifer rather have 8 pizza slices and 1 milkshake, or 5 pizza slices and 5 milkshakes?

pizza slices and milkshakes	milkshakes
pizza slices and milkshakes	milkshakes

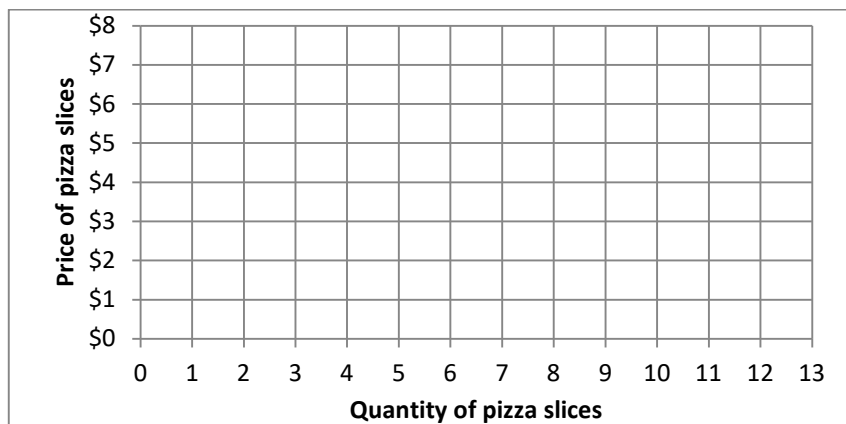
Suppose Jennifer has a budget of \$30 to spend on pizza and milkshakes. The price of milkshakes is \$3.

- c. **Using a straightedge**, carefully draw Jennifer’s budget line when the price of pizza slices is also \$3. Label this budget line “A”.
- d. How many pizza slices will Jennifer buy if the price of pizza slices is \$3?
- e. **Using a straightedge**, carefully draw Jennifer’s budget line when the price of pizza slices is \$6. Label this budget line “B”.
- f. How many pizza slices will Jennifer buy if the price of pizza slices is \$6?

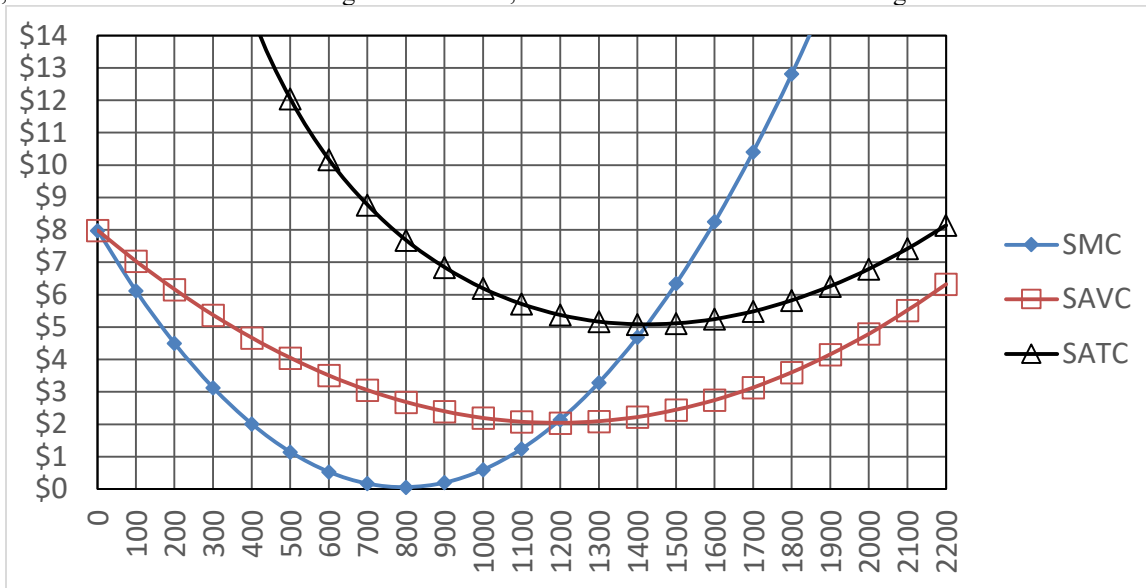
pizza slices

pizza slices

- g. Plot two points on Jennifer’s demand curve for pizza, 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 500 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.

\$	thousand
\$	thousand
\$	thousand

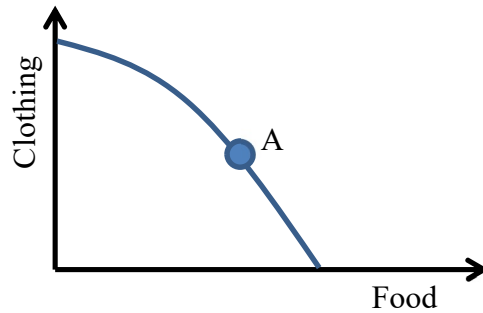
- d. Suppose the company were currently producing 100 parts for some unknown reason. If the company produced one more part, by how much would its total cost increase? That is, what would be the *change in total cost* as the company increased output from 100 to 101 parts? (Give an answer to the nearest 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 \$13. 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 \$13?
- i. Suppose the price of parts is \$1. 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 \$1?

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

units of clothing
units of food

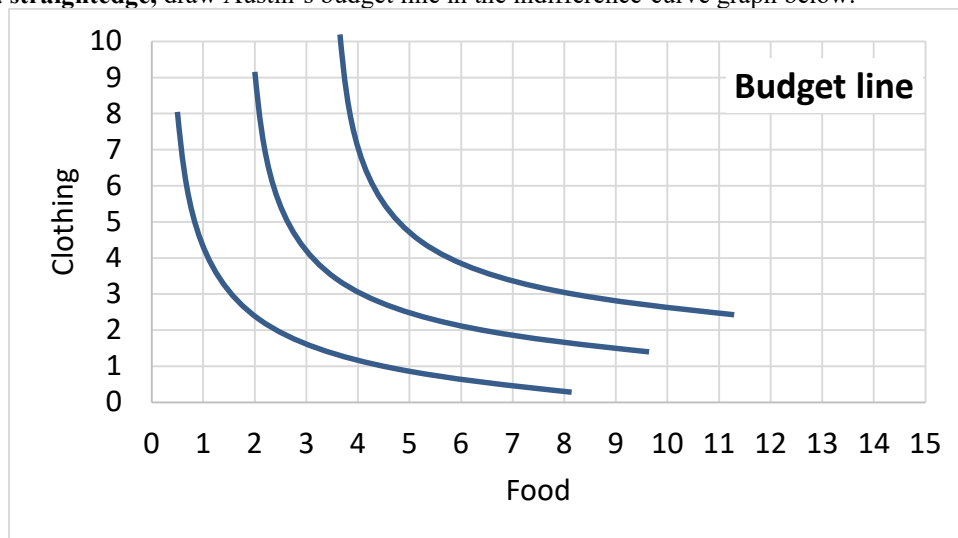
Assume this country's economy is in competitive equilibrium in all markets and the price of a unit of clothing is \$4.

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

\$

Austin is a consumer in this economy. He has an income of \$40.

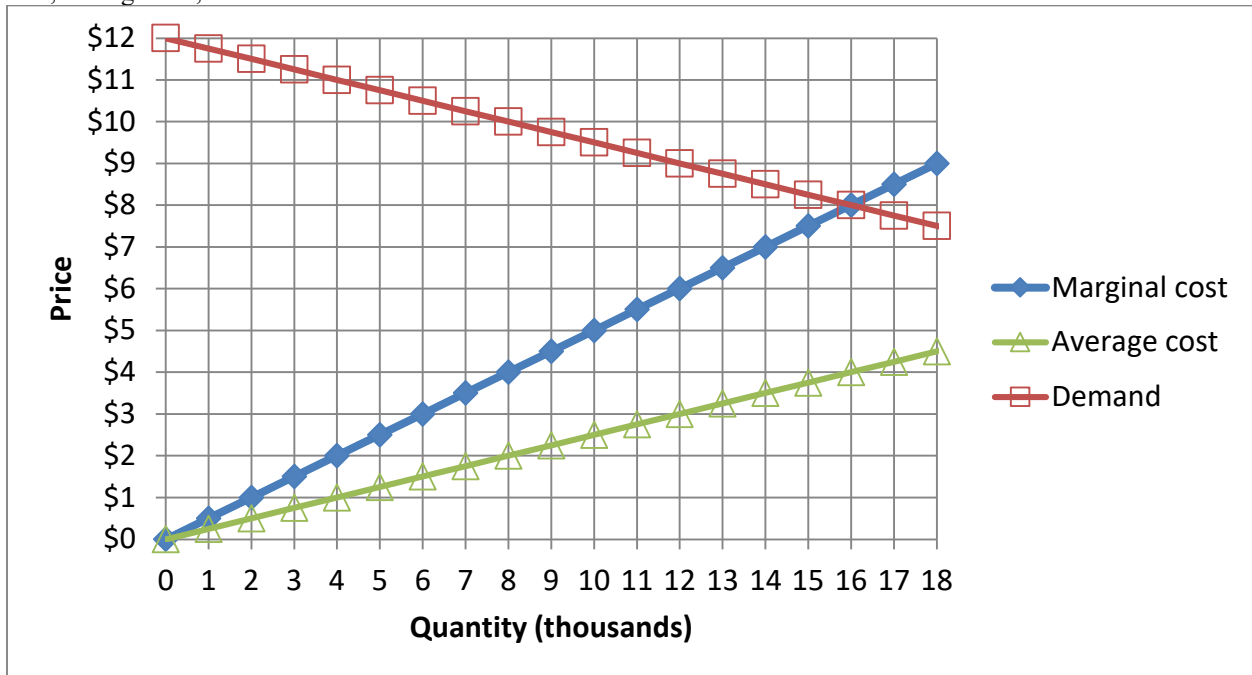
- d. Using a straightedge, draw Austin's budget line in the indifference-curve graph below.



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

units of clothing
units of food
units of food

(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.

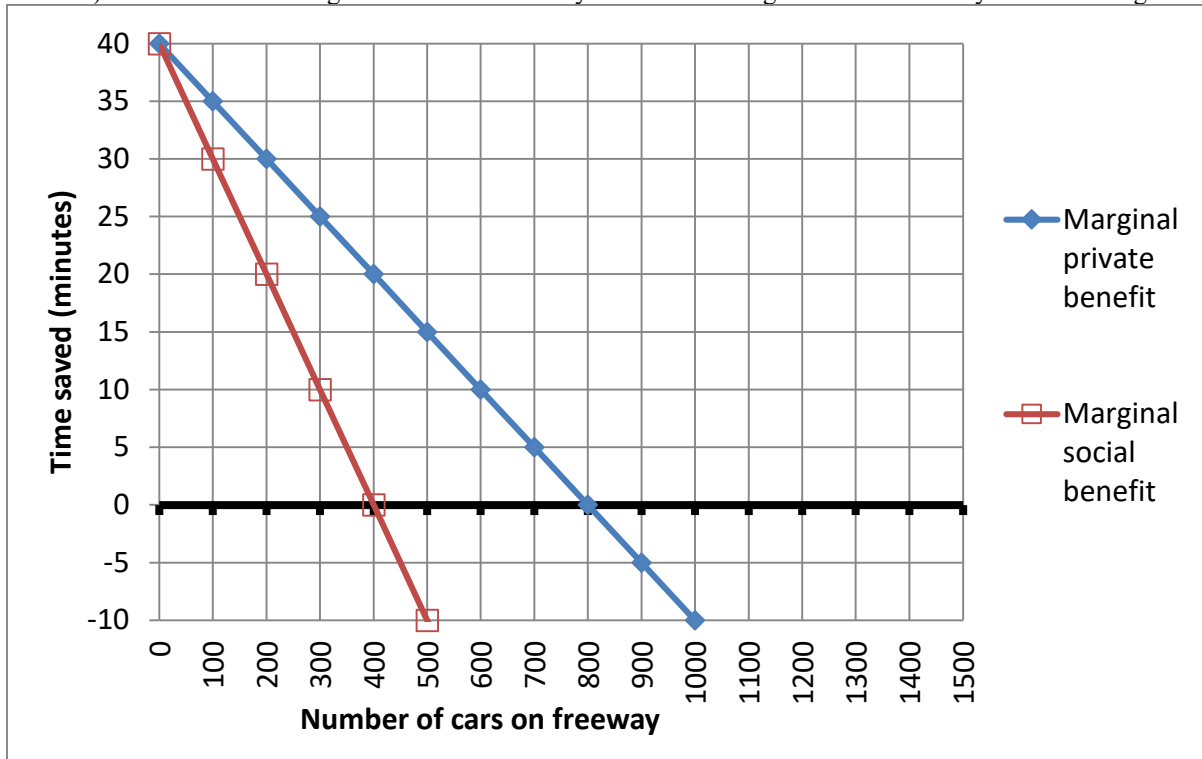
	thousand
\$	
\$	thousand
\$	thousand
\$	thousand

(9) [Nonrival goods: 6 pts] A city government will offer a free outdoor concert series during the summer in a neighborhood park. About **1000** 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: $MB = 20 - 2Q$.

- 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

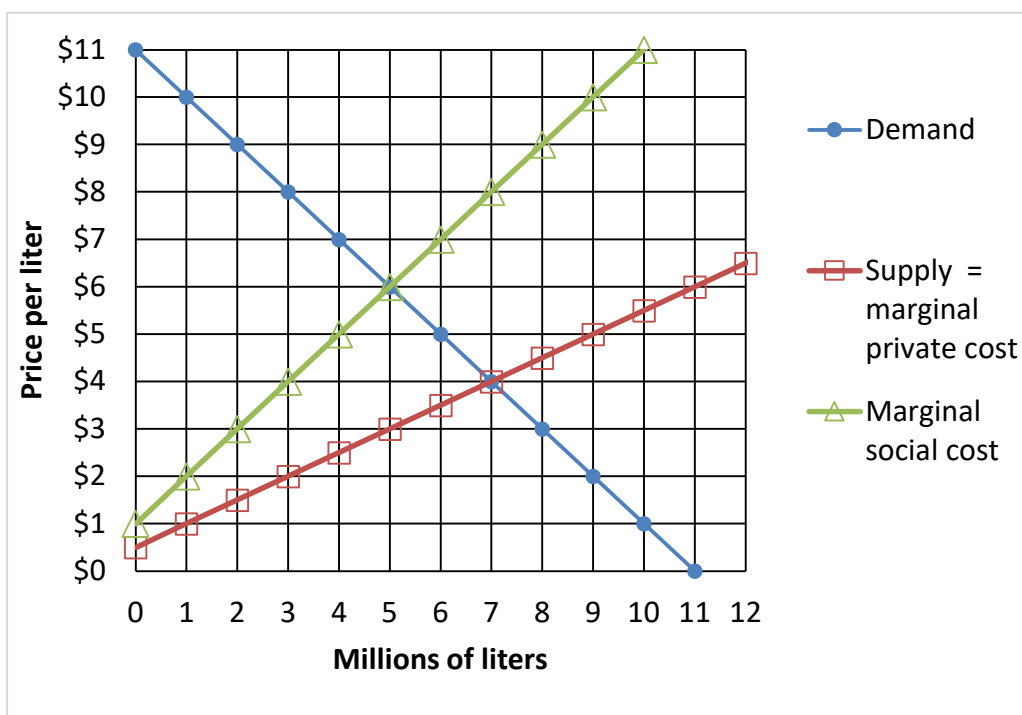
(10) [Common property resources: 6 pts] A certain freeway can easily become congested. It is the quickest route to downtown, but during rush hour, when one car enters the freeway, all the cars already on the freeway slow down a bit. The graph below shows the average time saved by each car when it enters 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 1 unit per year (a reduction of 4 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	\$15	\$35	\$25	\$45	\$5

Command-and-control:

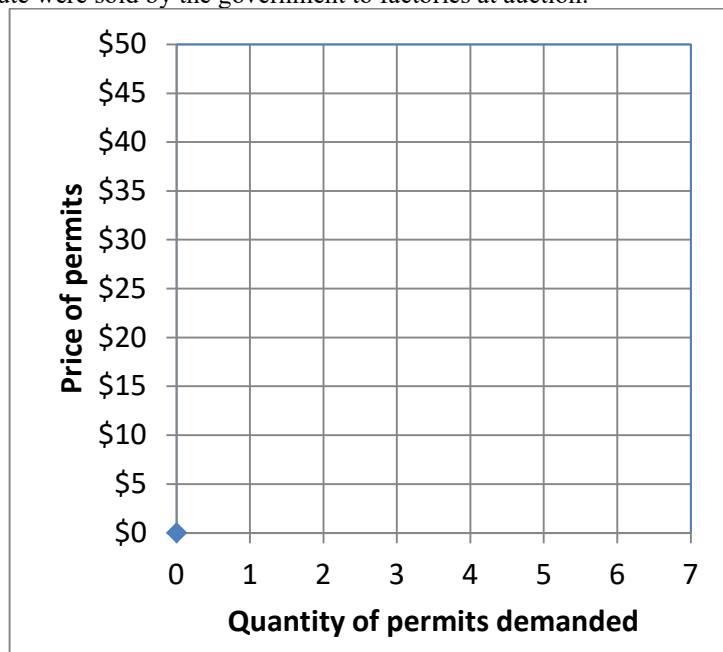
- a. To minimize the total cost of cleaning up, which 4 factories should be commanded to clean up? Give their letters.
- b. What would be the total cost of cleaning up for these 4 factories together?

	\$

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 1 permit (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 factory would win the permit? Give its letter.
- 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 4 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 1 unit: \$0, \$10, \$20, \$30, \$40, \$50, or \$60?
- h. What would be the total cost of cleaning up for those 4 factories that chose not to pay the fee?

	\$

[end of exam]