# 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 circle the one best answer to each question. [1 pt each, 24 pts total]

(1) The assumption in economics that people are *rational* implies that people
a.   do the best they can with what they have.
b.   make sacrifices today for a better future.
c.   maximize their income.
d.   use math to make decisions.
e.   ignore "soft" concerns like friendships and charity.

(2) Consider the production function shown below. As more labor is used, the marginal product of labor
a.   decreases.
b.   increases.
c.   first increases, then decreases.
d.   remains constant.
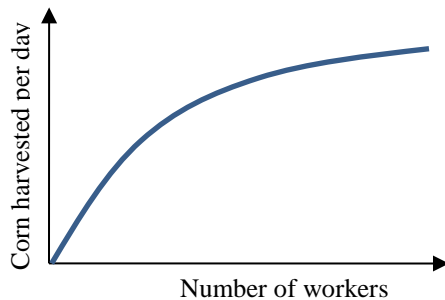
(3) A fall in the in the price of chips will shift the demand for salsa to the right, assuming chips and salsa are
a.   complementary goods.
b.   substitute goods.
c.   normal goods.
d.   inferior goods.

(4) The graph below shows the demand for movie tickets. If the market price of movie tickets falls from $6 to $4, then total consumer surplus
a.   decreases by $2000.
b.   increases by $2000.
c.   increases by $4000.
d.   increases by $6000.
e.   increases by $8000.
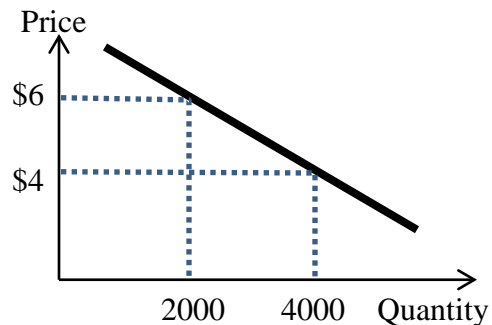
(5) Which demand curve below is *more* elastic?
a.   Demand curve A.
b.   Demand curve B.
c.   Both have the same elasticity because they pass through the same point.
d.   Cannot be determined from information given.
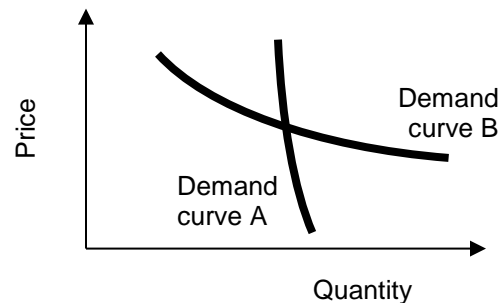
(6) To be a *Pareto improvement*, a change in the economy must result in
a. winners but no losers.
b. gains to winners that exceed any losses to losers.
c. at least some winners.
d. cost savings for the government.
e. a rise in wages, salaries, and other compensation.

(7) Suppose the price of pumpkins in Des Moines is $7.50 and the cost of shipping a pumpkin between Des Moines and Omaha is $2. Markets are *in equilibrium* if the price of pumpkins in Omaha is
a. $2.
b. $5.
c. $6.
d. $10.

(8) Consider the market for pizzas depicted in the graph below.
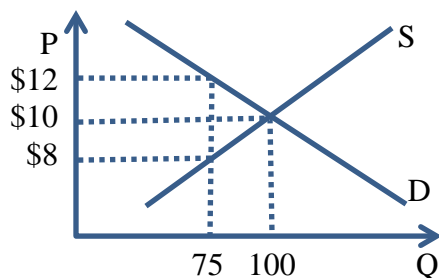
Suppose a law is passed prohibiting sellers from selling more than 75 pizzas. With this quota, the price of pizzas will be
a. $4.
b. $8.
c. $10.
d. $12.
e. Cannot be determined from information given.

(9) Suppose the price elasticity of supply for items sold on the internet in Iowa is 8.0 and the price elasticity of demand is -1.0 . If Iowa imposes a tax on internet sales,
a. sellers will pay most of the tax.
b. buyers 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.

(10) The Springfield City Swimming Pool is now open 10 hours a day. Suppose a study shows that in the current situation, the marginal benefit of keeping the pool open is $20 per hour, and the marginal cost is $50. If these numbers are accurate, then Springfield would be better off
a. keeping the City Pool open more hours.
b. keeping the City Pool open fewer hours.
c. making no change in the City Pool hours.
d. Cannot be determined from information given.

(11) Production of electric cars is increasing. An increase in the number of companies who produce electric cars is called a change at the
a. extensive margin.
b. intensive margin.
c. marginal product.
d. marginal revenue.

(12) 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.

(13) *Price equals average cost* in a competitive industry in long-run equilibrium because
a. business owners have a sense of fairness.
b. individual firms adjust their output levels using the rule "price equals average cost" 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.

(14) A firm that takes price as given believes its marginal revenue from selling one more unit will be
a. equal to zero.
b. less than the price of that unit.
c. greater than the price of that unit.
d. equal to the price of that unit.

(15) 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. a firm's average cost is negatively related to its quantity.

(16) Suppose a car dealer with market power is selling four cars per day at $10,000 each. If it cuts the price to $9,000, it can sell one more car (that is, five cars per day). Marginal revenue for the fifth car is thus
a. $10,000.
b. $9,000.
c. $5,000.
d. $4,000.

(17) Diesel trucks with poorly-tuned engines spew particulates (small particles) out their exhaust pipes, with adverse effects on the health of *other* people (not just the truck owners) who breathe the air. These trucks therefore create
a. an external benefit.
b. an external cost.
c. a common property resource.
d. an inferior good.

(18) I enjoy viewing my neighbors' flowers, even though I do not pay for them. My neighbor's flowers therefore create
a. an external benefit.
b. an external cost.
c. a common property resource.
d. a private good.

(19) 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.

(20) 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.

(21) Sonic Burgers requires you to pay for a hamburger before you eat it. Only one person can eat the hamburger, of course. So a hamburger from Sonic is
a. a rival good.
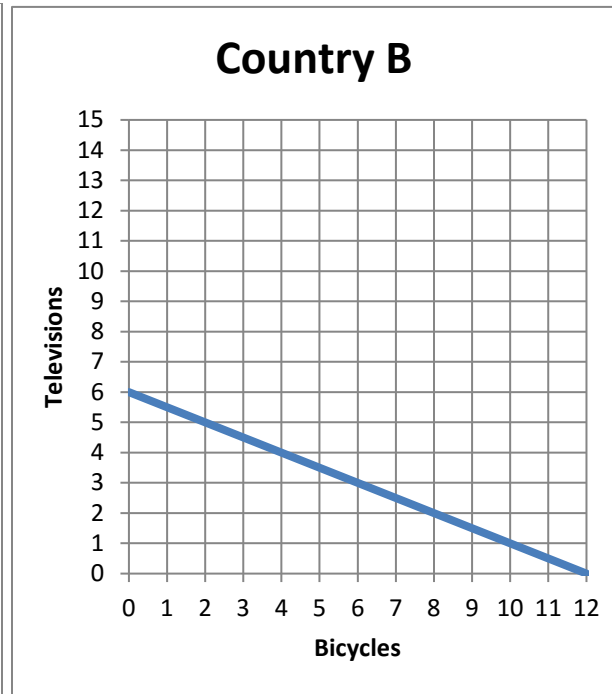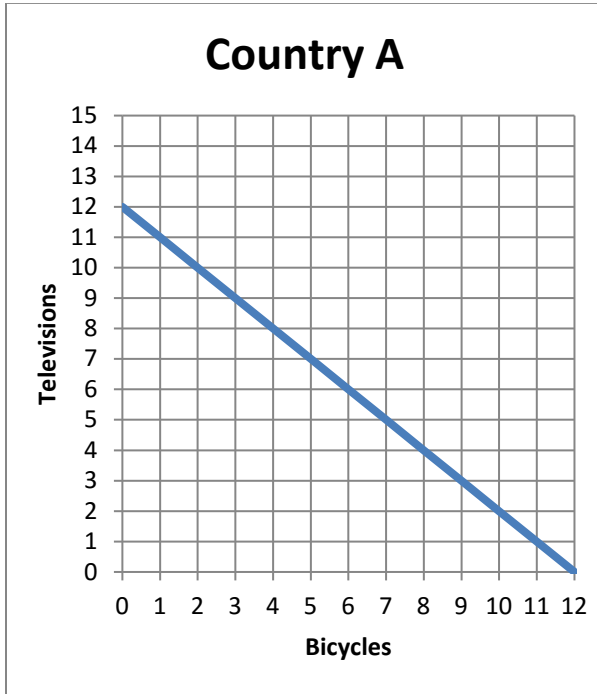b. an excludable good.
c. both of the above.
d. none of the above.

(22) 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.

(23) 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 rival good.
b. an excludable good.
c. both of the above.
d. none of the above.

(24) The preservation of endangered species, such as the bald eagle, is a benefit we all can enjoy simultaneously, but no one can be forced to pay for it. Therefore species preservation is
a. a rival good.
b. an excludable good.
c. both of the above.
d. none of the above.

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) [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.

Country A

Televisions (y-axis, 0 to 15)
Bicycles (x-axis, 0 to 12)

Country B

Televisions (y-axis, 0 to 15)
Bicycles (x-axis, 0 to 12)

a. What is Country A's opportunity cost of producing a television?

b. What is Country B's opportunity cost of producing a television?

c. What is Country A's opportunity cost of producing a bicycle?

d. What is Country B's opportunity cost of producing a bicycle?

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

f. 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**.

(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 *pizza*: The price of mozzarella cheese (an important ingredient in pizza) rises.
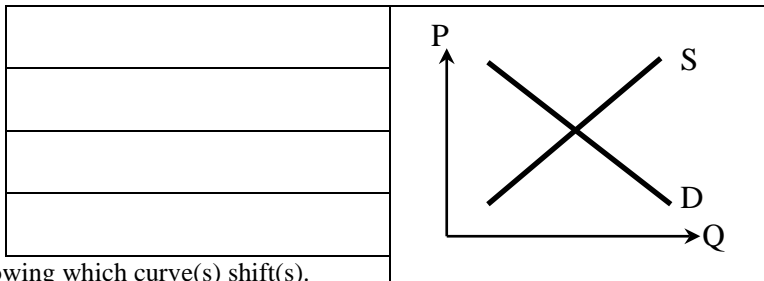
Does demand shift *left*, shift *right*, or remain *unchanged* ?
Does supply shift *left*, shift *right*, or remain *unchanged* ?
Does the equilibrium price *increase, decrease,* or *cannot be determined* ?
Does the equilibrium quantity *increase, decrease,* or *cannot be determined* ?
Sketch a graph of this scenario at right, showing which curve(s) shift(s).

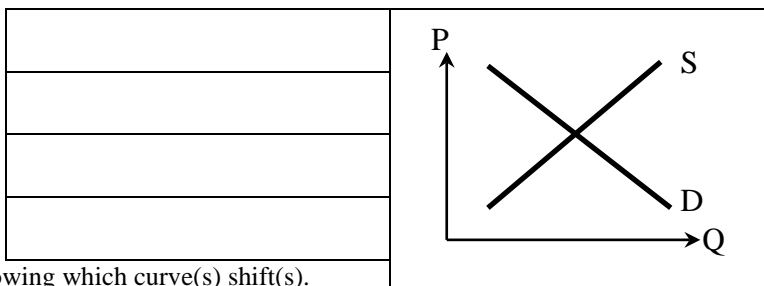b. Consider the market for *chicken*: The price of beef rises.

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 *coal*: Suppose new safety regulations raise the cost of digging coal. Simultaneously, the price of natural gas falls sharply.
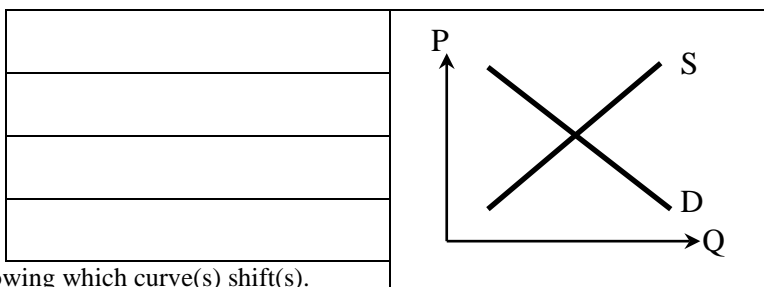
Does demand shift *left*, shift *right*, or remain *unchanged* ?
Does supply shift *left*, shift *right*, or remain *unchanged* ?
Does the equilibrium price *increase, decrease,* or *cannot be determined* ?
Does the equilibrium quantity *increase, decrease,* or *cannot be determined* ?
Sketch a graph 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 5%. Suppose the price elasticity of demand for water is -0.4. Assume everything else affecting demand for water remains constant.

a. According to the information above, is demand for water *elastic, inelastic,* or *unitary-elastic*?

b. As the price rises, will the amount of water consumed *increase*, *decrease*, or remain *constant*?

c. ... by approximately how much?

%

d. Will the total revenue received by water utility *increase*, *decrease*, or remain *constant*?

e. ... by approximately how much?

%

(4) [Business revenue and cost—definitions: 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 revenue from producing and selling another unit of output.

b. Change in cost divided by change in output.

c. Total cost divided by the quantity of output.

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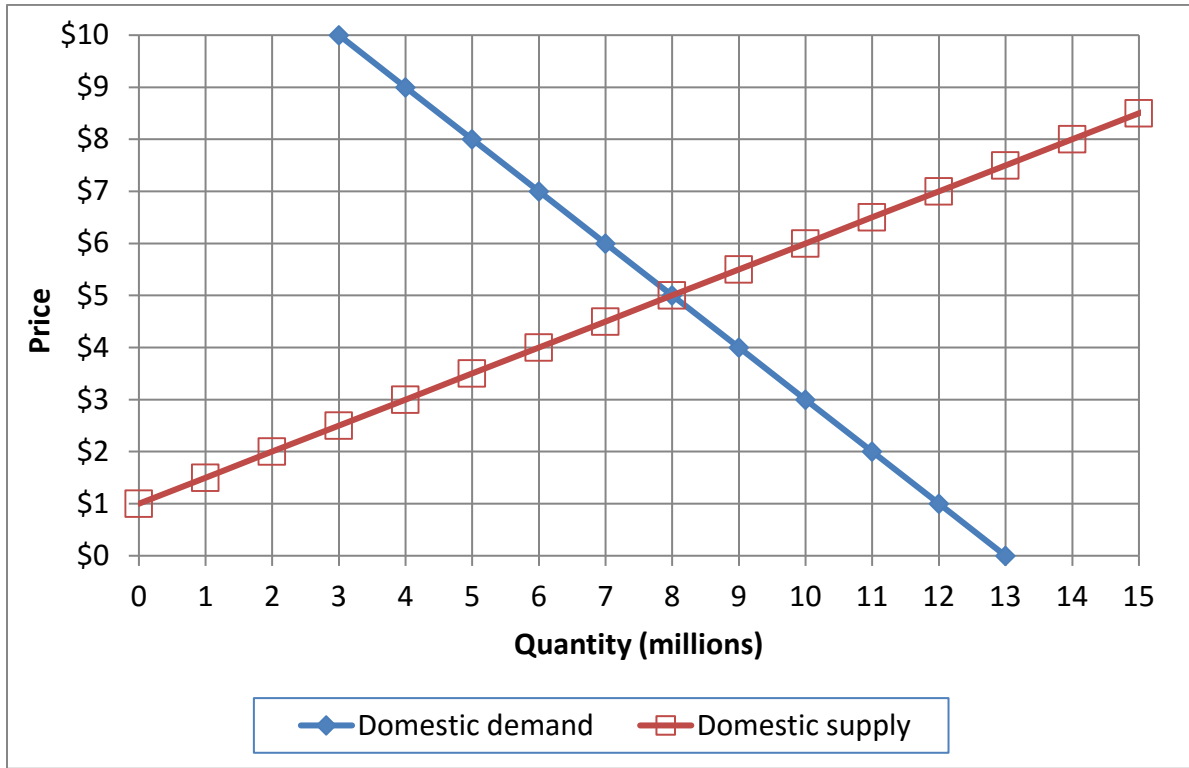
a. At first, international trade in screwdrivers is not permitted. Find the
   equilibrium price without international trade.

$

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

b. Will this country now *export* or *import* screwdrivers?

c. How many?

million

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

e. By how much?

$ million

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

g. By how much?

$ million

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

i. By how much?

$ million

(6) [Consumer choice and demand: 14 pts]   The indifference curves in the graph below represent Beth's preferences for ice cream cones and pizzas.
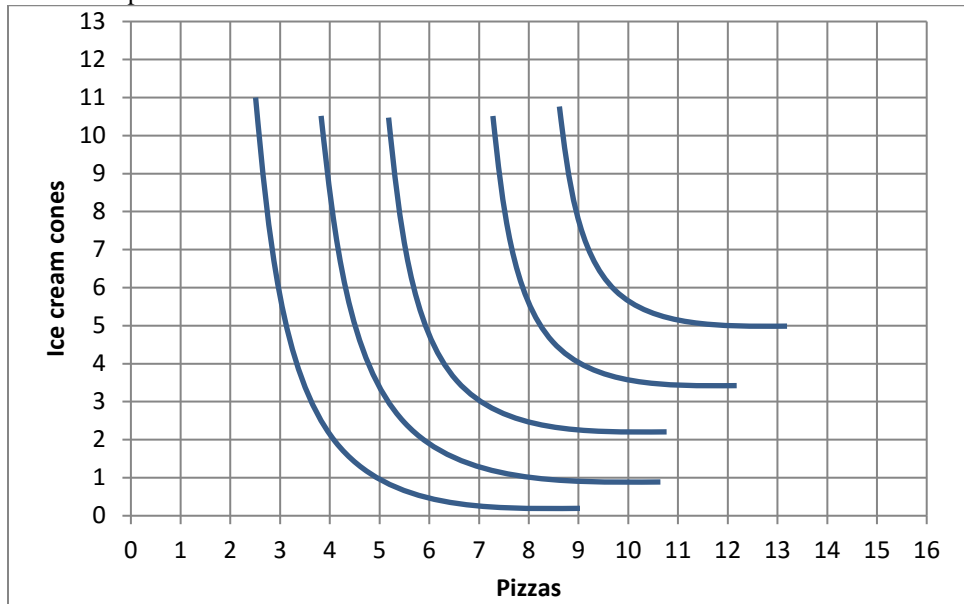
a. Would Beth rather have 3 pizzas and 6 ice cream cones, or 5 pizzas and 3 ice cream cones?

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

| pizzas and	ice cream cones
pizzas and	ice cream cones

Suppose Beth 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 Beth's budget line when the price of pizzas is $4. Label this budget line "A".

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

pizzas

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

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

pizzas

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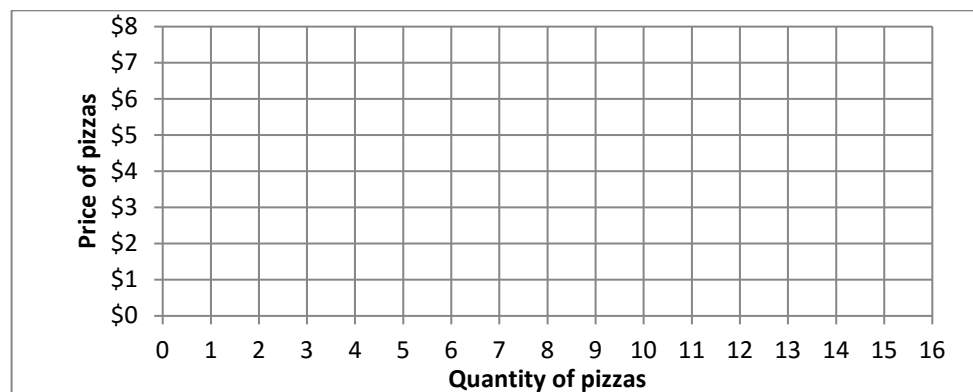
(7) [Short-run cost curves and supply: 20 pts] ABC Manufacturing Company makes a small part used in automobiles. ABC is a small company in a big market, and therefore takes its output price as given. In the short run, the company faces daily cost curves as shown in the following diagram. Here, SMC denotes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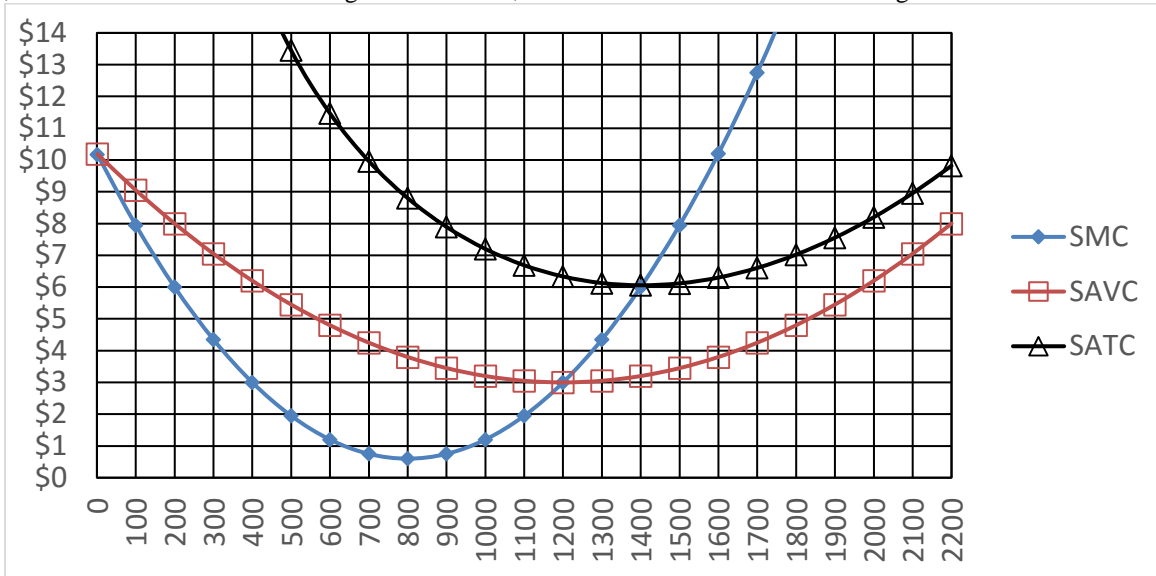
Suppose the company were currently producing 2000 parts for some unknown reason.

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 500 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 500 to 501 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 $10. 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 $10?

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?

(8) [Efficiency of competition: 12 pts] The following graph shows the market for basketballs.
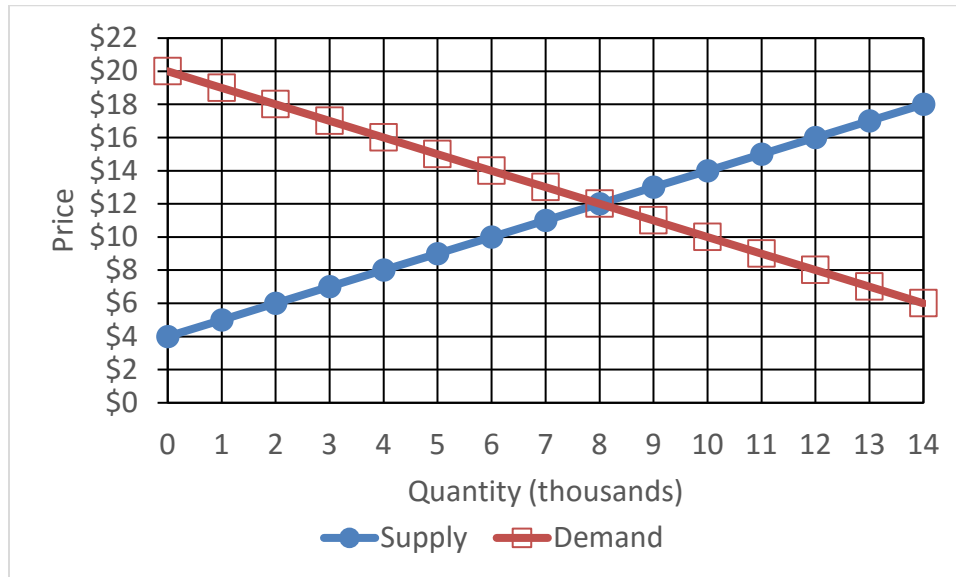
Suppose only 6 thousand basketballs were being produced for some unknown reason.

a. How much would consumers be willing to pay for a 6001st basketball?

$

b. By how much would the basketball industry's total costs increase from producing a 6001st basketball?

$

c. By how much would total social surplus increase from producing a 6001st basketball?

$

Alternatively, suppose the market for basketballs is in competitive equilibrium at 8 thousand basketballs.

d. How much were consumers willing to pay for the 8,000th basketball?

$

e. How much did the basketball industry's total cost increase from producing the 8,000th basketball?

$

f. By how much would total social surplus increase from producing a 8,001st basketball?

$

(9) [Monopoly, price discrimination: 22 pts] Suppose an ice rink is the only one in town, so it enjoys monopoly power. The graph below shows the ice rink's monthly demand, marginal cost, and average cost curves.
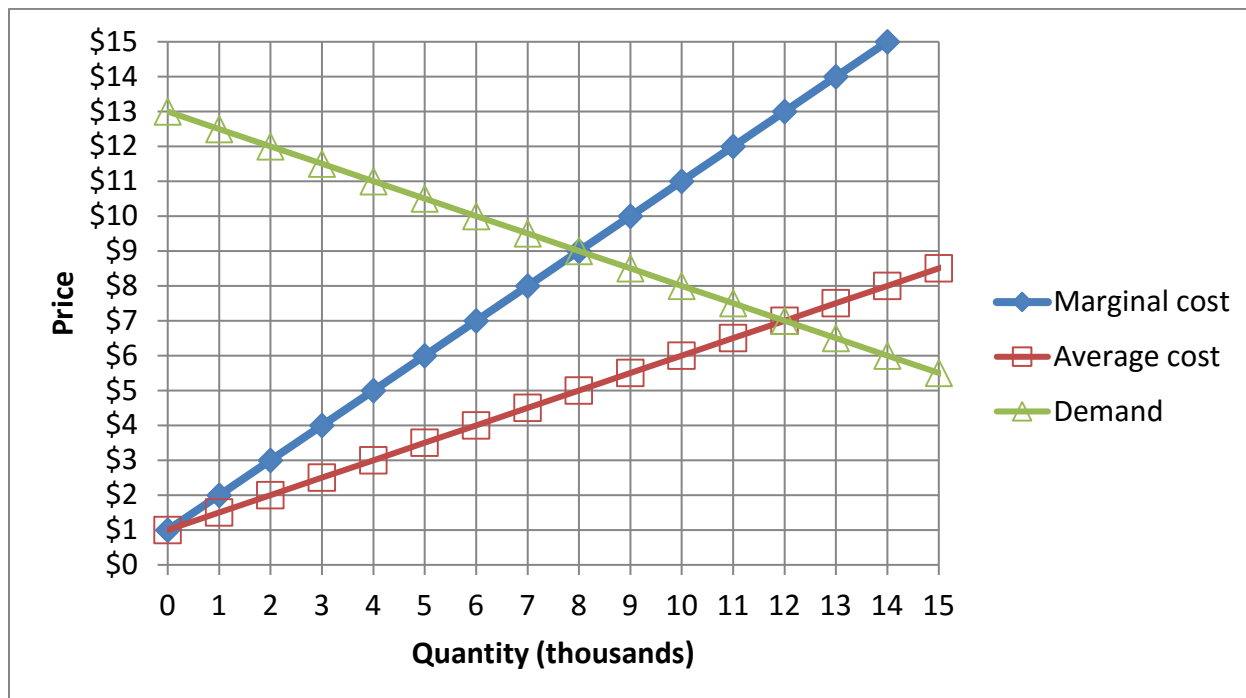
First, suppose the ice rink must charge the same admission price to everyone.
  a. *Using a straightedge*, draw and label the ice rink's marginal revenue curve.

|	
b. Compute the ice rink's profit-maximizing quantity.	thousand
c. Compute the price that the ice rink would charge.	$
d. Compute the ice rink's profit.	$ thousand
e. Compute consumer surplus	$ thousand
f. Compute the social deadweight loss from this pricing scheme.	$ thousand

Second, suppose the ice rink can somehow charge a different admission price to each person, equal to the maximum price that person is willing to pay. In other words, suppose *perfect price discrimination* is possible.

g. Compute the ice rink's profit-maximizing quantity.	thousand
h. Compute the ice rink's revenue.	$ thousand
i. Compute the ice rink's profit.	$ thousand
j. Compute consumer surplus.	$ thousand
k. Compute the social deadweight loss from this pricing scheme.	$ thousand

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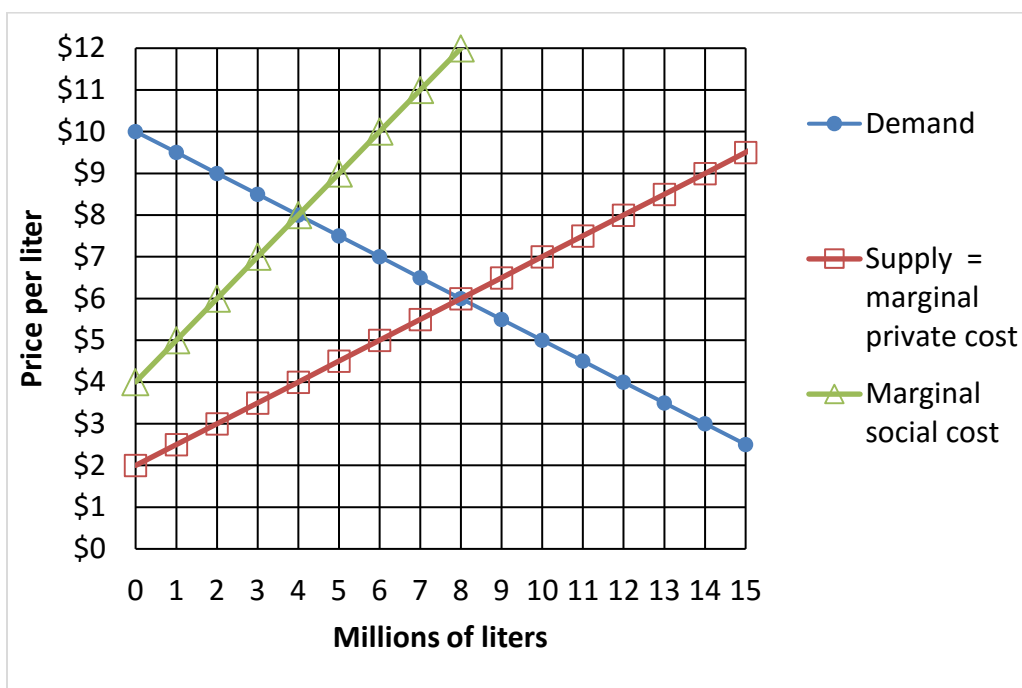
a. Compute the (unregulated) competitive equilibrium price.

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

(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	$250	$400	$350	$150

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.")
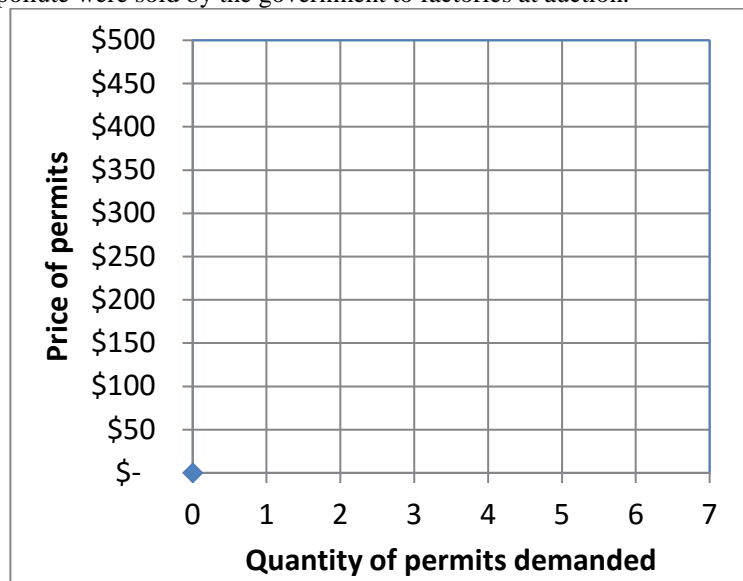
In this auction, the price starts at $0 and rises in increments of $100.

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: $0, $100, $200, $300, $400, or $500 ? $

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

(12) [Public 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 expression (or formula): **MB = 30 – 2 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

(13) [Common property resources: 6 pts] A certain freeway can easily get 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.
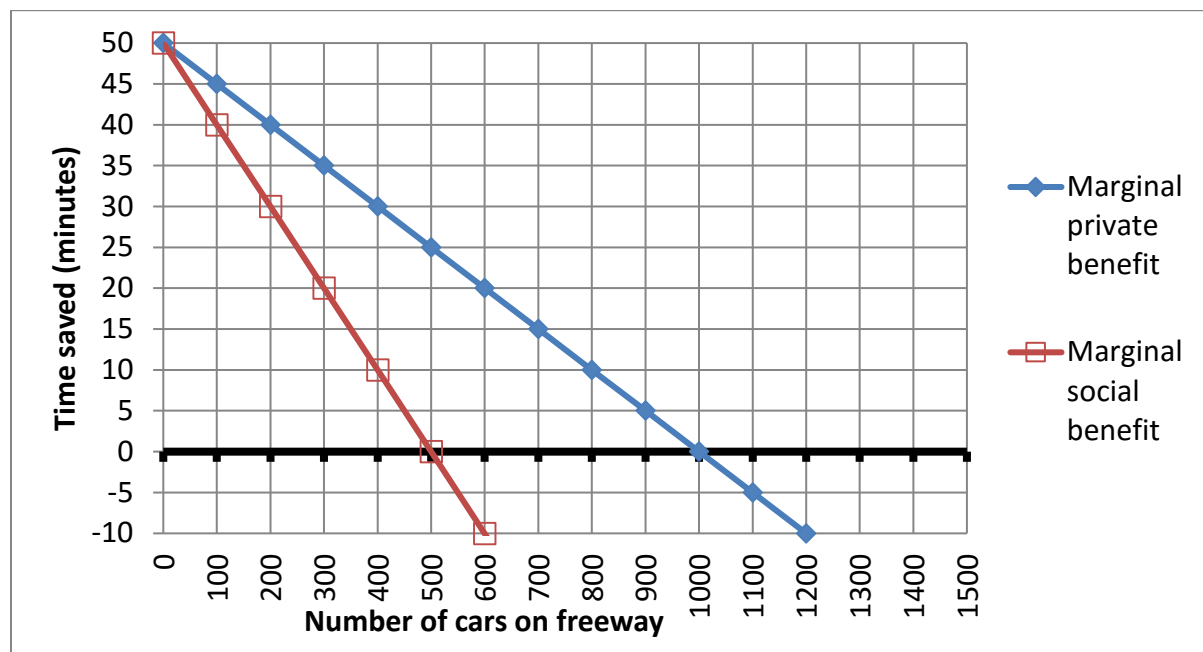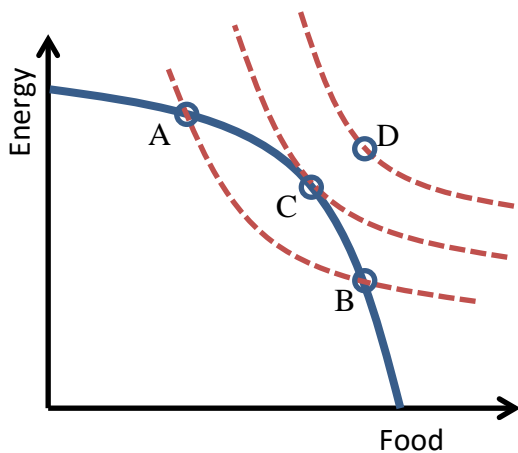

a. How many cars will enter the freeway if entry onto the freeway is unregulated?

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
$	

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

(1) The graph below describes the economy of the country of Fredonia. The solid curve is Fredonia's production possibility curve and the dashed curves are indifference curves for a representative consumer. The market for food is competitive, but the market for energy is a monopoly. Where is Fredonia's economy—point A, B, C, or D? Why?

(2) The graph below describes the economy of the country of Fredonia. The solid curve is Fredonia'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. Where is Fredonia'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]