Midterm
Microeconomics for Public Policy I
Fall 2026
October 20, 2026

Name: _____

Exam Instructions

1. **Write your name on page 17.**
2. Write your GWID on each page. If you don't know your GWID, write your birthdate (or some other made-up number) on **each page**. I request this so that if we scan exams we will be sure not to misplace pages.
3. Answer all questions.
4. The exam is graded out of 100 points. Points for each section and question are indicated on the exam.
5. Write legibly. Illegible exams cannot be graded.
6. The final page is intentionally left blank for extra work. If you do extra work on this page (or any other non-standard location) that you would like to be counted, note it clearly near the question you are answering.
7. Label all figures as needed.
8. We give liberal partial credit. If a question has multiple parts and you can't answer one, it is in your best interest to answer all the remaining parts to the best of your ability.
9. **Explain** your answers as needed. When appropriate, you should also explain any assumptions that you make to arrive at your answer. Explanations may yield partial credit.
10. Be concise.

For marking purposes only

Part A _____

Part B _____

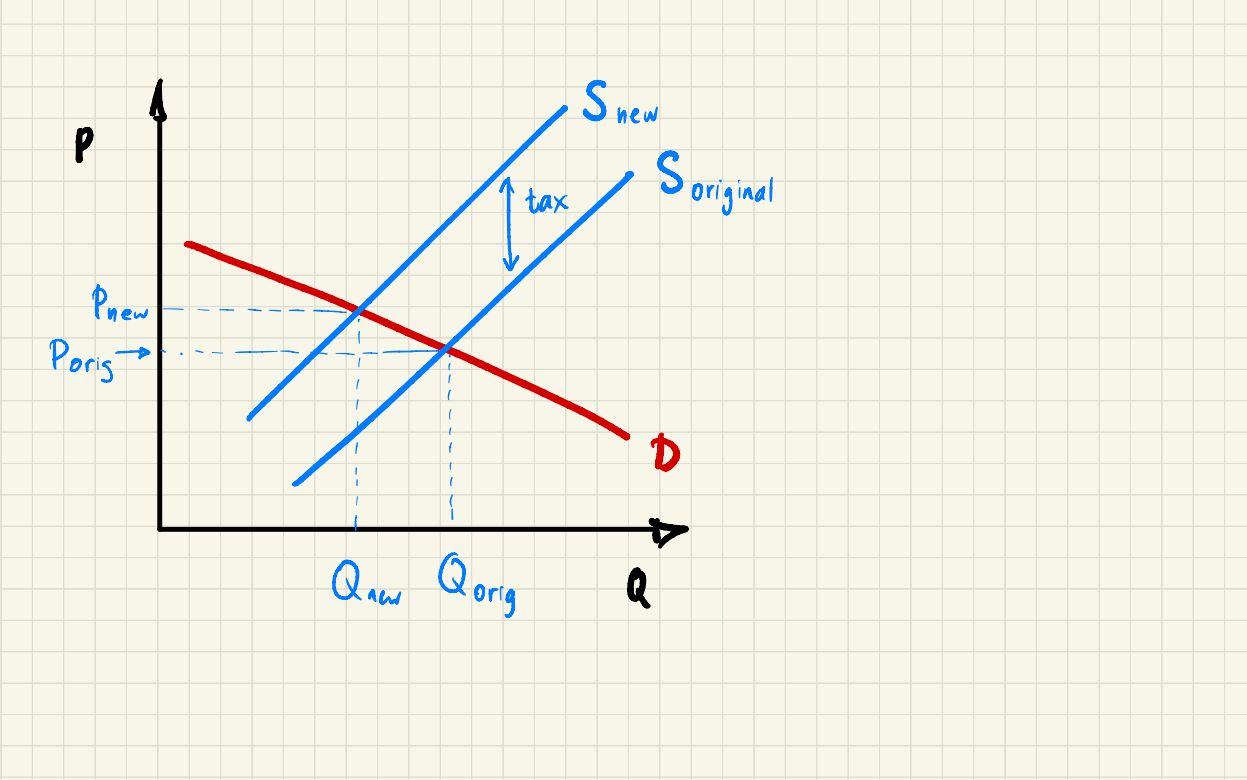
Part C _____

total _____

A. Ripped From the Headlines (10 points)

Read the article from *USA Today* at the end of the exam.

1 (3). Draw a graph showing an original market equilibrium and the new equilibrium, including the statutory incidence of this tax. (I am not looking for specific elasticities in either the supply or the demand curve; show the statutory incidence and the two equilibria.)



2 (3). Does the article give enough information to calculate the economic incidence of the tax? Why or why not?

No, because economic incidence is about what happens to prices. we don't know the new average price of sugary beverages after the tax, so we can't say anything specifically about economic incidence.

3 (4). Given what you've read in the article, which side of the market is likely more elastic? Explain why, giving two pieces of evidence from the article.

I take from the article that consumers are more elastic. Here is why I think so

- sales fell by quite a bit in Philadelphia, which suggests to me that consumers have substitutes

 GWID: _____

- sales increased in nearby jurisdictions, which suggests that consumers have geographically proximate places to which they can shift their consumption

 GWID: _____

B. Short Answer Questions (40 points, 5 points each question)

1. Give two examples of things that could shift demand for movies (movies writ broadly, not just movies in the theatre), and describe which way each example shifts the demand curve.

Things that can shift the demand curve include

- income
- tastes
- price of substitutes

For movies, demand could decrease (shift inward) due to an increased taste for video games, which are a substitute. Demand could increase (shift outward) as people's income increases.

An answer of "price" here is incorrect. Prices deliver movement along the demand curve, rather than a demand curve shifts.

2. Define the cross-price elasticity of demand. Then consider the cross price elasticity of demand for bananas and apples, where we are interested in the impact of a change in price for bananas. For you personally, is the sign of the cross-price elasticity for bananas and apples negative or positive? Explain why.

The cross-price elasticity of demand is the change in consumption of good X due to a change in price of good Y:

$$E_{X,Y} = \frac{\%\Delta Q_Y}{\%\Delta P_X}$$

In the case of this problem, this is as below, where B stands for bananas and A for apples.

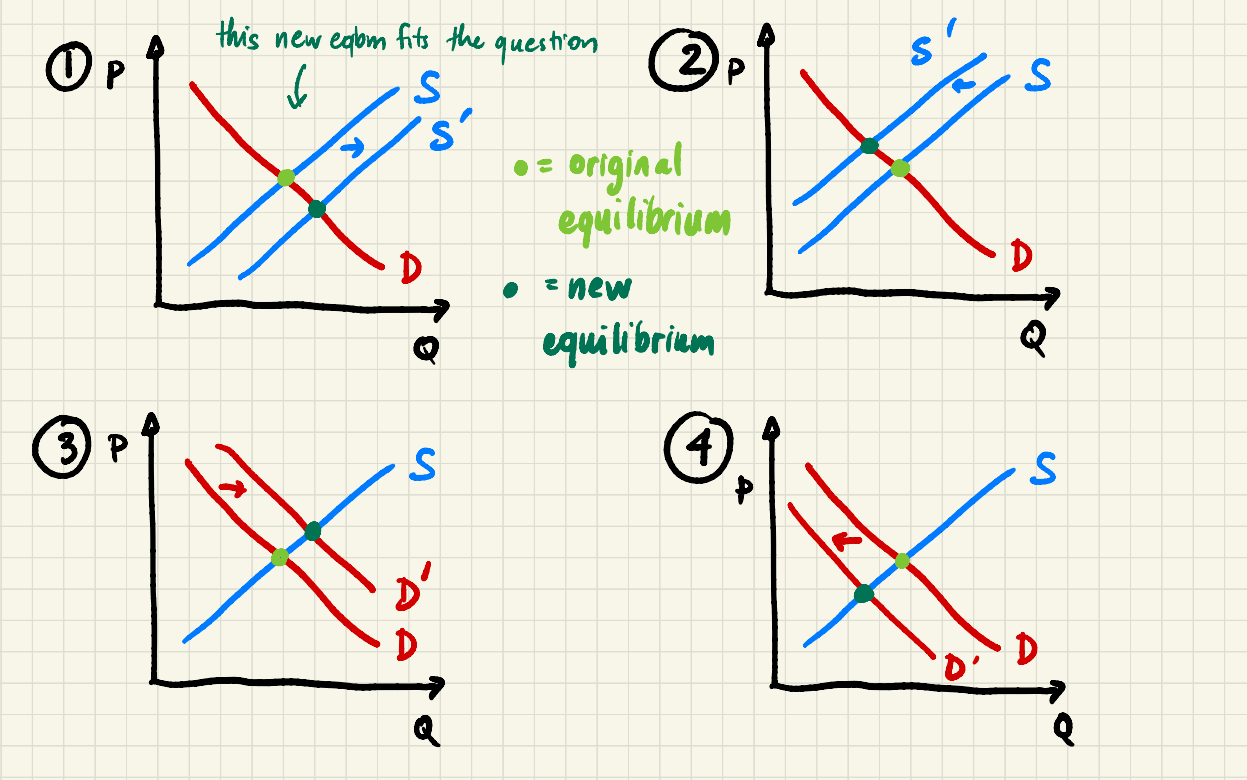
$$E_{B,A} = \frac{\%\Delta Q_A}{\%\Delta P_B}$$

For me, an increase in the price of bananas will increase my consumption of apples. These two goods are somewhat substitutable for me. Thus, my cross price elasticity is positive. Any logically argued answer here is fine.

3. Suppose that either supply or demand (not both!) change in the market for lentils. Further suppose that the equilibrium price declines and the equilibrium quantity increases. Did the supply curve or the demand curve move? Which way?

Below I draw four possibilities when only the supply or demand curve shifts. The only picture consistent with this problem is when the supply curve shifts outward.

 GWID: _____



4. Define a luxury good (as we have defined in class) and give an example of something that is a luxury good for you. Explain why.

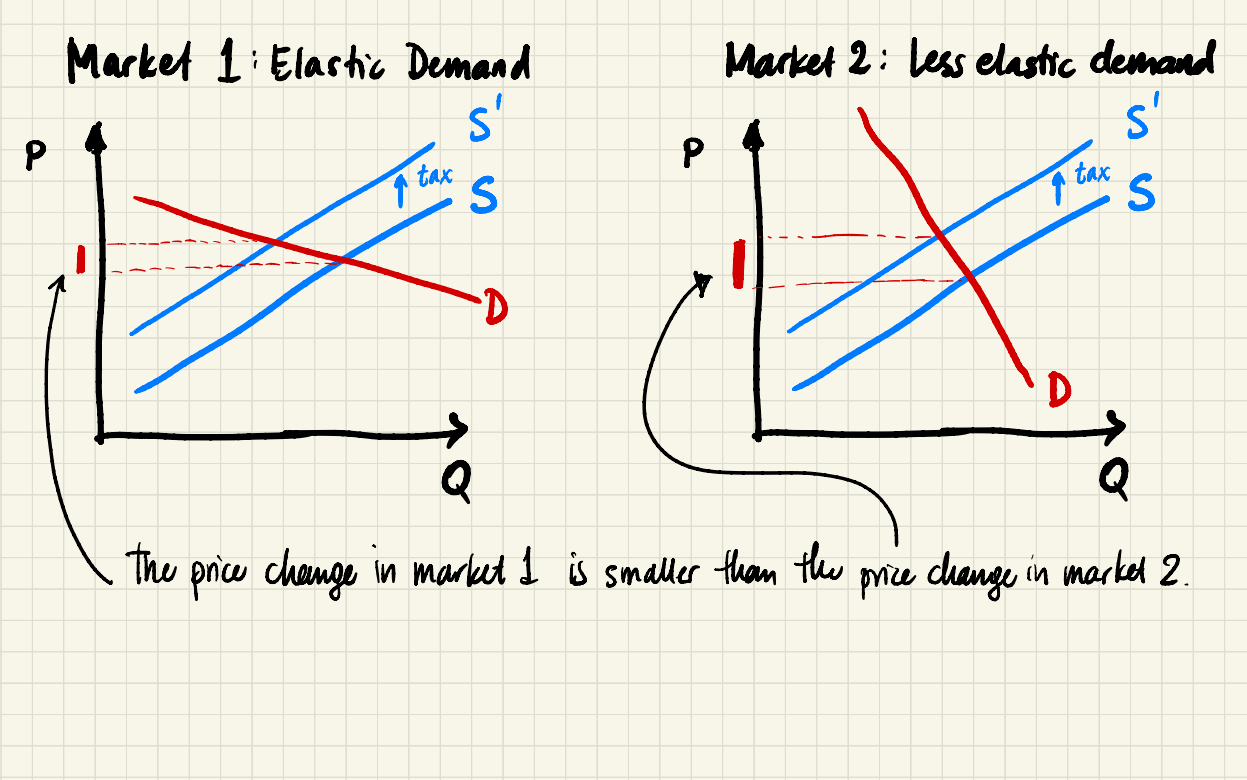
A luxury good is a good for which the income elasticity of demand is greater than one:

$$E = \frac{\%\Delta Q_X}{\%\Delta I} > 1$$

For me, good (expensive) bread is a luxury good. As my income increases, I spend disproportionately more (in percentage terms) on bread.

5. Suppose that the government is contemplating a new tax, for which the statutory incidence falls on suppliers. The government is considering two markets in which to levy this tax. Market 1 has relatively elastic demand, and Market 2 has relatively inelastic demand. In which market do consumers bear a greater economic burden of the tax? Explain the logic behind your conclusion using pictures and words.

 GWID: _____



hladd graph paper

6. Suppose that Joe's demand for ice cream is given by $Q = 5-2P$ and Mary's demand for ice cream is given by $Q = 10-3P$. What is the maximum willingness to pay for ice cream, or the highest price anyone in the market is willing to pay? Explain how you arrived at your answer.

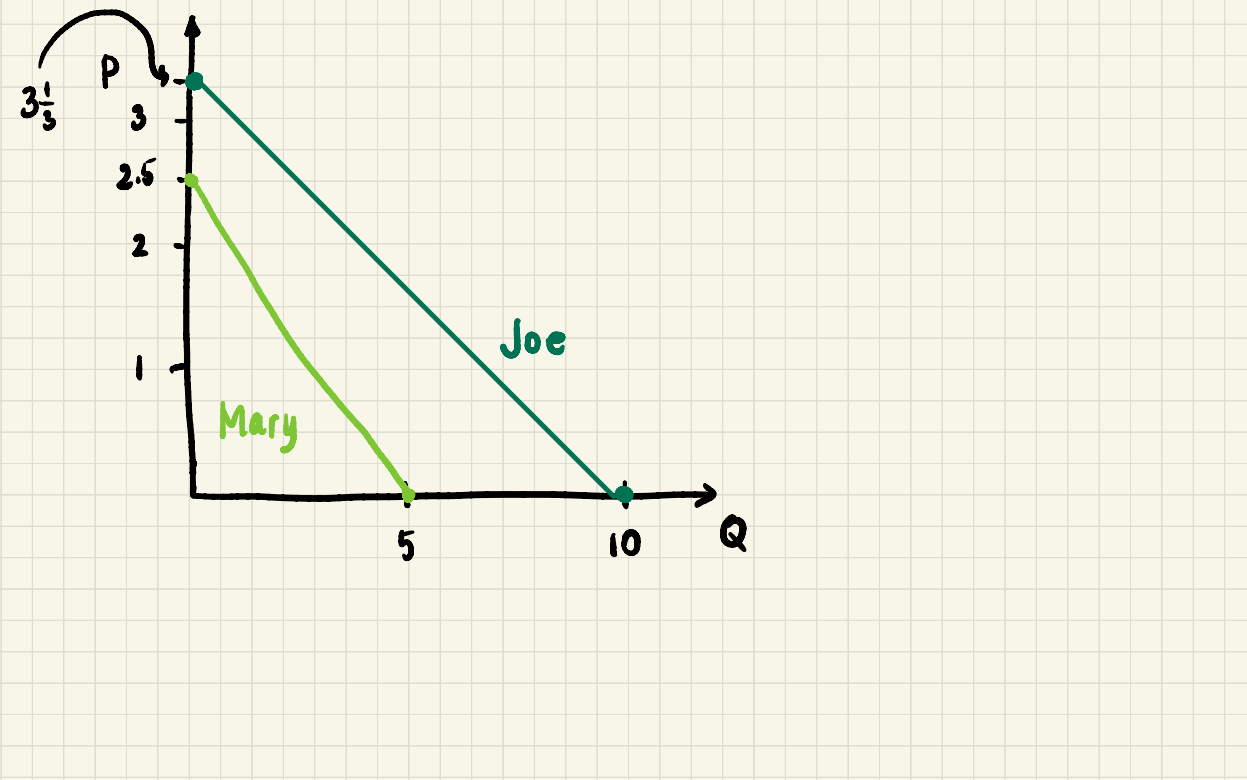
Find the P and Q intercepts for each person so we can draw Joe's and Mary's demand curves.

For Mary, when $P = 0$, $Q = 5$. When $Q = 0$, $0 = 5 - 2P$, or $P = \frac{5}{2} = 2.5$.

For Joe, when $P = 0$, $Q = 10$. When $Q = 0$, $0 = 10 - 3P$, or $P = \frac{10}{3} = 3.33$.

These demand curves are picture below.

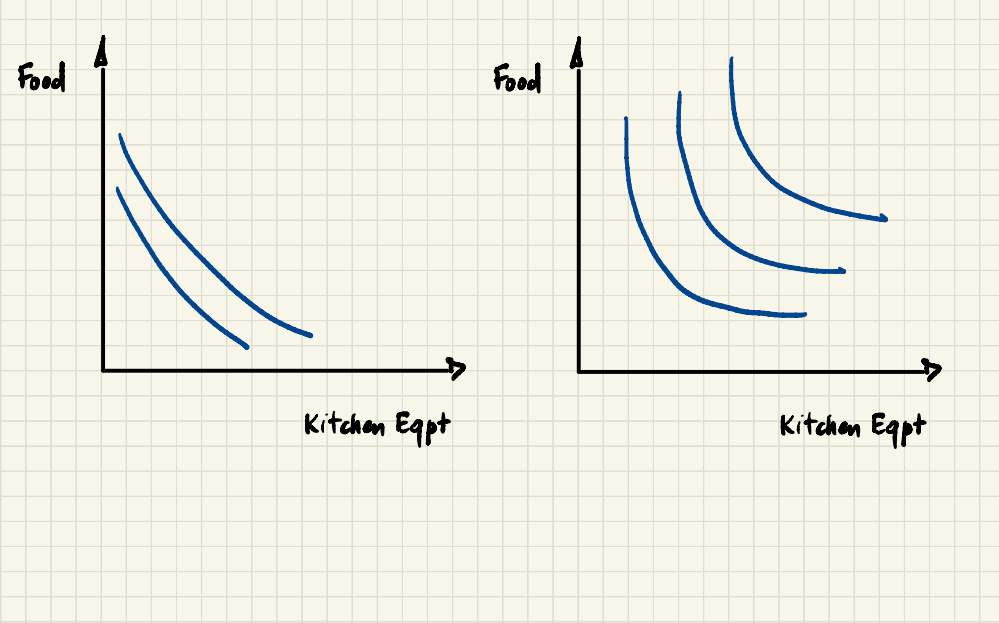
 GWID: _____



Joe is willing to pay more than Mary for any quantity, and the maximum he's willing to pay is \$3.33 per ice cream.

7. Which of the two isoquants below are more likely to represent the production of cooked restaurant meals? The two goods in the figures are food – such as fruits, vegetables, flour, and eggs – and kitchen equipment, such as ovens, frying pans, knives, space and labor. Explain why you chose the figure you did.

 GWID: _____



First notice that the figure on the right shows isoquants with goods that are more substitutable. The figure on the left shows goods that are more complimentary. In the production of restaurant meals, food and kitchen equipment are complements. You cannot produce a restaurant meal without food inputs, and you also need the ability to cook the food. It is difficult, verging on impossible, to substitute for food with kitchen equipment, or for kitchen equipment with food.

8. Define the marginal product of capital. Given an example of a firm and a specific type of capital that displays a diminishing marginal product.

The marginal product of capital is the additional output produced by an additional unit of capital.

We expect a diminishing marginal product when labor does not change. So, with labor (number of professors) held fixed, additional classrooms do not help in the production of additional MPPs at the Trachtenberg School.

 GWID: _____

C. Medium Answer Questions (51 points, sub-points as noted in questions)

1 (24, 4 points each unless noted otherwise). Supply, Demand and Zucchini

Demand for zucchini is $P = 100 - 5Q$ and supply for zucchini is $P = 20 + 3Q$. (Zucchini is sold in 10-kilo bags.)

(a) What is the market equilibrium price and quantity of these 10-kilo bags of zucchini? Draw a chart that shows the supply curve, demand curve, relevant y-intercepts and the equilibrium point. Label the axes.

Let supply equal to demand to find the market equilibrium.

$$\begin{aligned} 100 - 5Q &= 20 + 3Q \\ 80 &= 8Q \\ Q^* &= 10 \end{aligned}$$

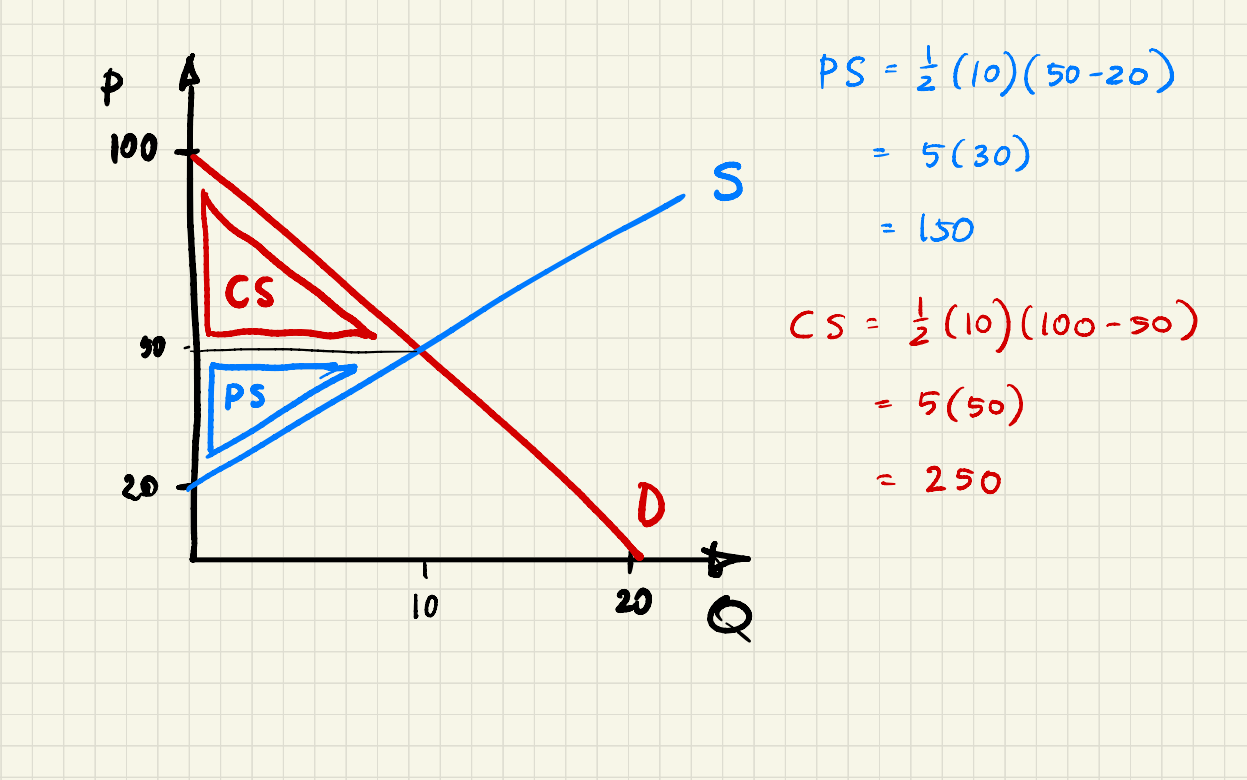
You can find the equilibrium price by plugging the equilibrium quantity into either equation: $P^* = 100 - 5Q^* = 100 - 5(10) = 50$. Alternatively, you could write $P^* = 20 + 3Q^* = 20 + 3(10) = 50$.

See graph in answer to (b).
add graph paper?

(b, 2) Define consumer and producer surplus and show their location in your chart.
Consumer surplus is the difference btween the market price and consumer willingness to pay. Intuitively, this is the value that consumers receive from consumption. Producer surplus is the difference between the market price and the lower price at which producers would have been willing to sell.

See graph below.

 GWID: _____

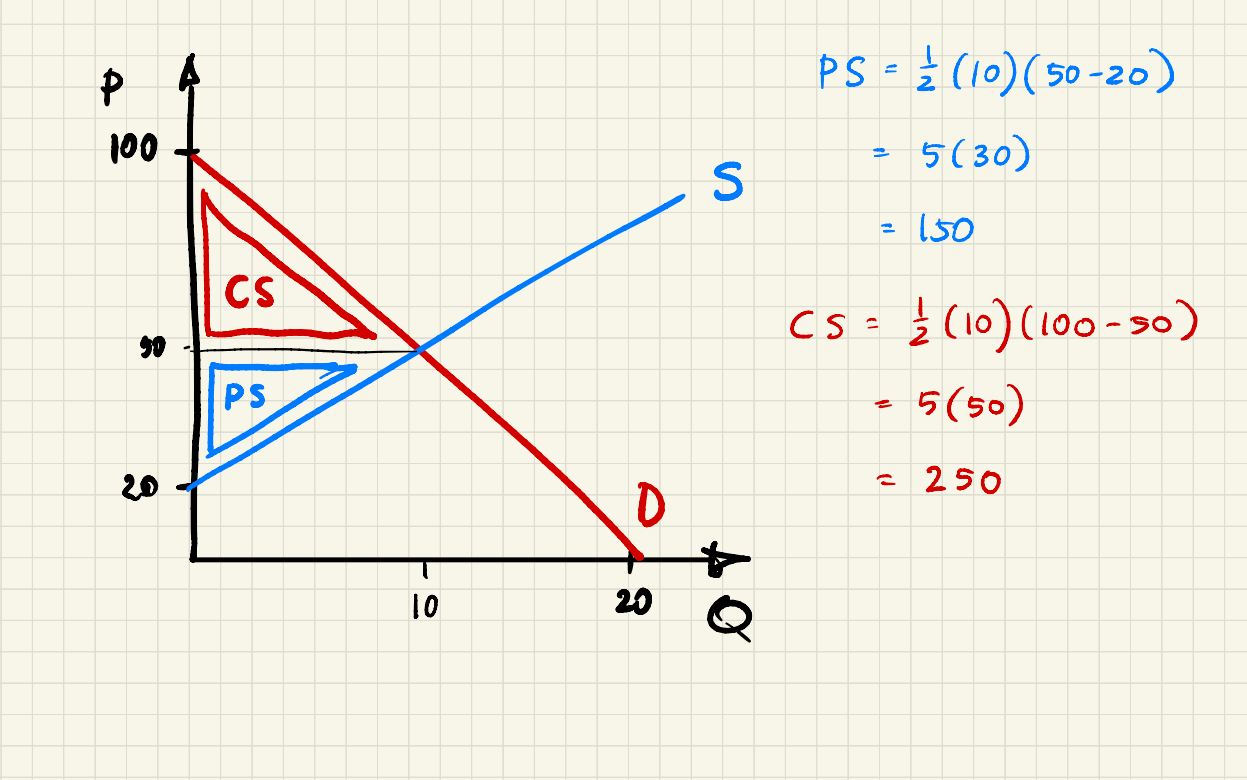


(c, 3) Give values for them in this market.

Consumer surplus is the difference btween the market price and consumer willingness to pay. Intuitively, this is the value that consumers receive from consumption. Producer surplus is the difference between the market price and the lower price at which producers would have been willing to sell.

See graph below.

 GWID: _____



(d) Suppose that the government wants to increase the quantity of zucchini its citizens eat. To do so, it says that 10-kilo bags of zucchini cannot be sold for more than \$40. Add this policy to your chart (or make a new chart if this is easier) and find the new equilibrium price and quantity with the policy.

The new equilibrium price is \$40 by policy; you can see this price in the figure below. Consumers would like to consume more than before, but producers would like to produce less. Because the government doesn't have a policy to force producers to grow zucchini, the equilibrium quantity in the market is the quantity that producers would prefer to produce at a price of \$40.

We can find this quantity by plugging in a price of \$40 into the supply curve:

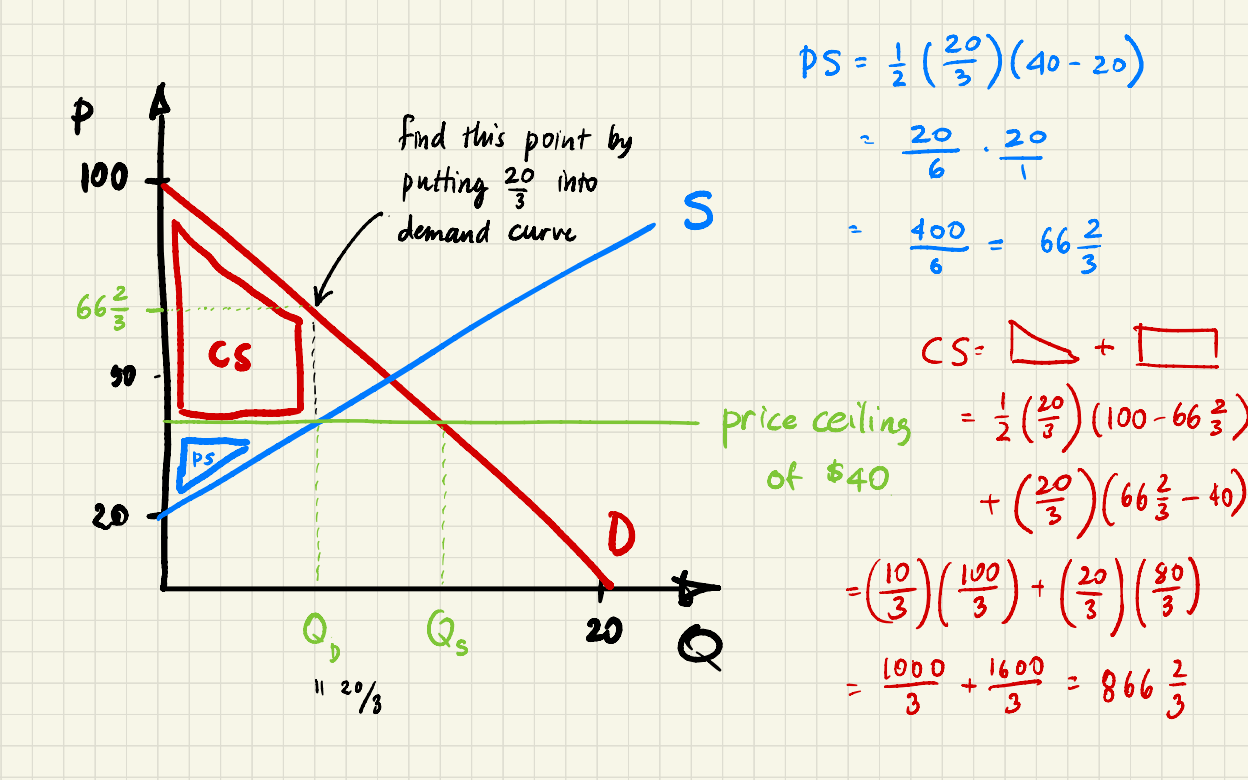
$$\begin{aligned} P &= 20 + 3Q \\ 40 &= 20 + 3Q \\ 20 &= 3Q \\ Q &= \frac{20}{3} \\ Q &= 18\frac{2}{3} \end{aligned}$$

See graph in answer to (d).

 GWID: _____

put graph paper

(e) Show the new producer and consumer surplus in a well-labeled chart. What are the values of producer and consumer surplus at the policy induced price of \$40?



Error in calculation above!

$$\begin{aligned} CS &= \left(\frac{10}{3}\right)\left(\frac{100}{3}\right) + \left(\frac{20}{3}\right)\left(\frac{80}{3}\right) \\ &= \left(\frac{1000}{9}\right) + \left(\frac{1600}{9}\right) \\ &= \frac{2600}{9} \\ &= 288.89 \end{aligned}$$

(f) Has the government achieved its objective (see part (c))? Why or why not?

While the government did succeed in lowering the price of zucchini, it did not succeed in its goal of increasing consumption of zucchini. It failed because producers are unwilling to increase production of zucchini at a price of \$40 per 10 kilos.

 GWID: _____

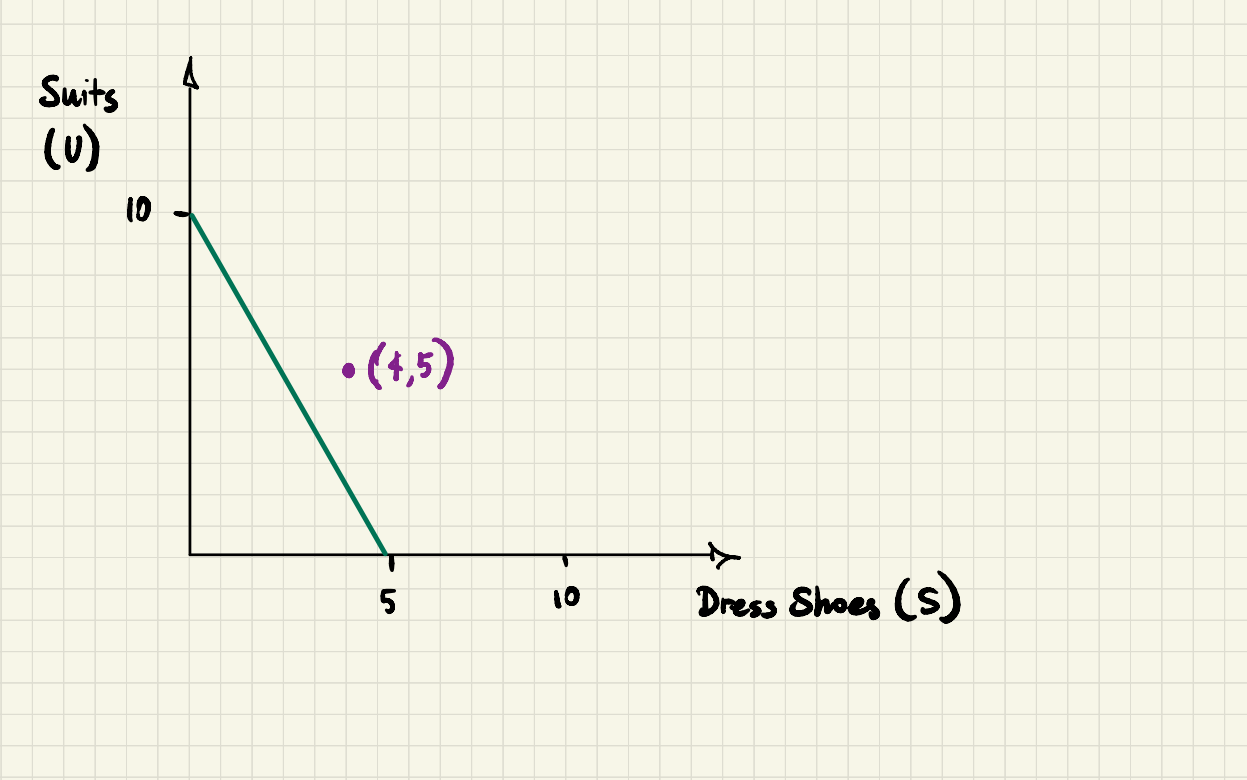
2 (26). Individual Decisionmaking

(a, 3) Suppose that Fiona's income is \$100, and that she purchases only suits (denoted U), which cost \$10 and dress shoes (denoted S), which cost \$20 per pair. Write the equation for Fiona's budget constraint.

The budget constraint is $I = P_U U + P_S S$. We can plug in the pieces given to write $100 = 10U + 20S$.

(b, 3) Draw the budget constraint, labeling the axes and intercepts. Put dress shoes on the horizonal axis and suits on the vertical axis.

add a bit of graph paper



(c, 4) If she could afford it, might Fiona prefer 4 pairs of dress shoes and 5 suits to any current optimal consumption? Why?

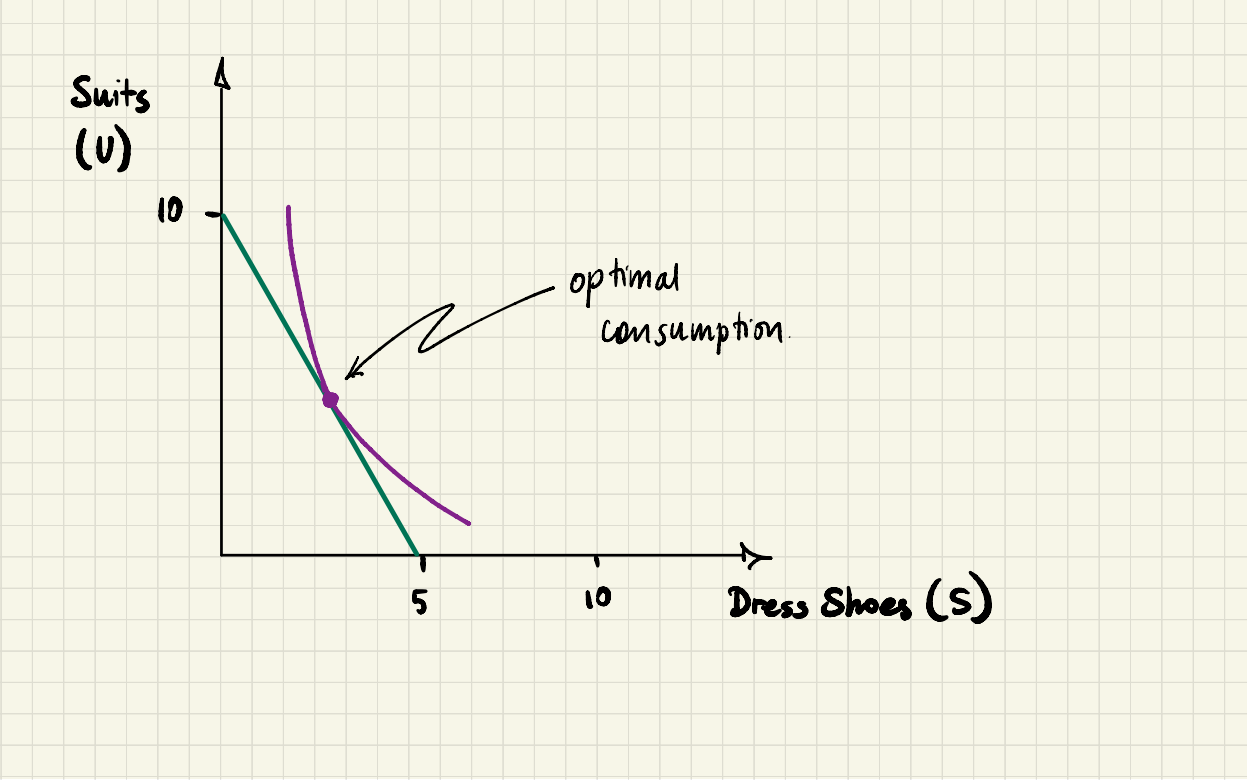
Yes. See the point labeled in the graph above. Any current optimal consumption point must lie along Fiona's budget constraint. The point (4,5) is beyond the budget constraint. Because we've assumed more is better, it is distinctly possible that she would prefer this

 GWID: _____

consumption point. However, the answer is not "absolutely yes," because Fiona might prefer to consume only suits or only shoes, in which case this bundle would make her worse off.

(d, 3) Draw an indifference curve on your picture from (b) (or repeat the picture with this curve) such that Fiona is consuming optimally. Note the point showing her optimal consumption choice.

add a bit of graph paper



(e, 4) Suppose that Fiona's marginal utility of suits is $MU_U = 2S$ and her marginal utility of shoes is $MU_S = 5U$. If she consumes 4 suits and 3 pairs of shoes, is she consuming optimally?

Fiona consumes optimally when

$$MRS_{S,U} = \frac{P_U}{P_S}$$

First consider the MRS. Plugging in the elements given in this problem, we can write

$$MRS_{S,U} = \frac{MU_S}{MU_U} = \frac{5U}{2S}$$

 GWID: _____

Now we consider the second half, which is the ratio of the prices:

$$\frac{P_U}{P_S} = \frac{10}{20} = \frac{1}{2}$$

.
If she consumed 4 suits and 3 pairs of shoes, we would write

$$MRS_{S,U} = \frac{MU_S}{MU_U} = \frac{5U}{2S} = \frac{5(4)}{2(3)} = \frac{20}{6} = 3.33$$

However, $\frac{P_U}{P_S} = 0.5$. Because $3\frac{1}{3} \neq 0.5$, she is not consuming optimally.

(f, 4) If Fiona is not consuming optimally in (e), of which good should she increase consumption? Explain why.

To think about how Fiona should change consumption, I find it easier to write the optimality condition as

$$\frac{MU_U}{P_U} = \frac{MU_S}{P_S}$$

In this problem, with the information given so far, this means

$$\frac{6}{10} = \frac{20}{20}$$

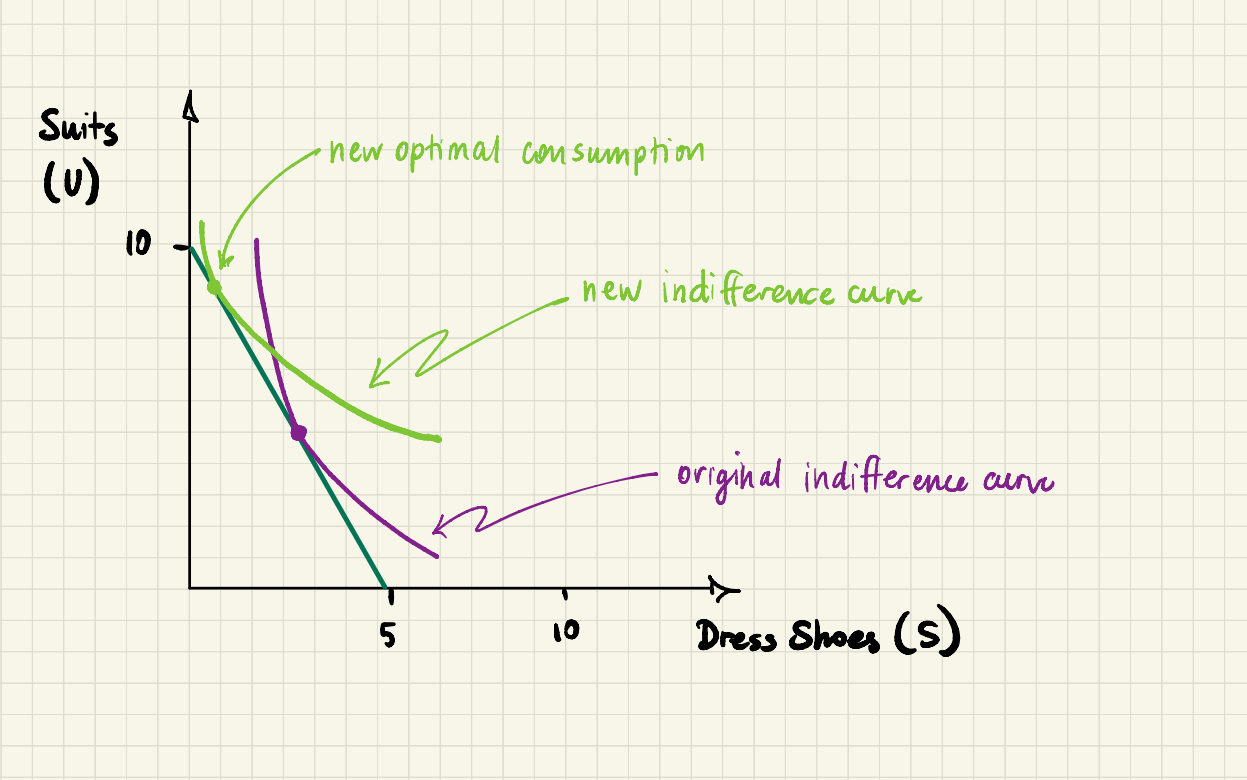
This means that Fiona is getting more marginal utility per dollar from her spending on S. Therefore, she should increase her consumption of S. This will decrease MU_S, increase MU_U and lead the two sides toward equality.

(g, 4) Suppose the government wants consumers to purchase more suits. It can give people money, unrestricted in use, or it can conduct an information campaign about the value of suits. Which of these policies impacts the indifference curve and why? Use a graph to show how an information campaign could increase suit consumption.
add a bit of graph paper

A public information campaign impacts a consumer's indifference curve, which describes tastes. It does not impact the budget constraint, which is determined only by income and market prices.

The new green indifference curve below shows a consumer who is now willing to give up fewer suits in exchange for dress shoes.

 GWID: _____


Suits
(U)
10
new optimal consumption
new indifference curve
original indifference curve
5
10
Dress Shoes (S)

GWID: _____

USA TODAY

MONEY Soft Drinks Add Topic

Philadelphia soda tax caused 'substantial decline' in soda sales, study finds



Nathan Bomey
USA TODAY

Published 9:44 a.m. ET May 15, 2019 | **Updated 7:47 a.m. ET May 17, 2019**

Soda sales plummeted in Philadelphia following the implementation of a tax on them, according to a new study.

A study published in the Journal of the American Medical Association found that the city's new tax caused a "significant and substantial decline" in soda sales.

The results also show that the tax crushed sales of soda in the city of Philadelphia while boosting sales in nearby areas as customers sought to avoid the levy.

Overall, sales fell by 38% even when factoring in the spike in neighboring areas, according to the study.

Philadelphia region shoppers bought almost 1 billion fewer ounces of soda in 2017 than in 2016, according to the study.

Just do it, already: 'Apple Watch or it doesn't count': How tech addiction might be ruining your workout

The outcome could influence policymakers weighing similar moves in other jurisdictions.

Supporters say the soda tax effectively discourages unhealthy consumption of sugary beverages, potentially fighting obesity and other conditions. Opponents say it disproportionately hurts lower-income people, damages businesses and represents an inappropriate infringement on consumer rights.

The tax, which took effect at the beginning of 2017, is 1.5 cents per ounce on sugary or artificially sweetened drinks. That translates into 30 cents for a 20-ounce bottle and about a

dollar for a 2-liter.

Sales inside the city of Philadelphia fell 51%. Sales in nearby areas increased 43%.

Beverage tax: Connecticut may be home to the first statewide beverage tax in the U.S.

Soda taxes, ad limits, better labels: Doctors want to limit sugary drinks for kids, teens

The study authors are Christina Roberto and Michael LeVasseur of the University of Pennsylvania's Perelman School of Medicine and Hannah Lawman of the Philadelphia Department of Public Health.

They examined 291 stores, including supermarkets, mass merchandise stores and pharmacies. They used the city of Baltimore as a control group to account for other factors not related to the tax.

The American Beverage Association, which has opposed soda taxes, said the study shows that "beverage taxes hurt working families, small local business and their employees."

The interest group said "taxes on common grocery items like beverages have never really improved public health" and said half of all beverages contain no sugar.

“America’s beverage companies believe there is a better way to help people reduce the amount of sugar they get from beverages than unproductive taxes," the group said in a statement. "We’re creating more drinks with less or no sugar and we’re making smaller bottle and can options more widely available and boosting consumer demand for these options through our marketing."

Follow USA TODAY reporter Nathan Bomey on Twitter @NathanBomey.