1.7.2 Summary Quiz: Elasticity in Action

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Question 1

1/1 point (graded)

In the last video, Kiran defined **income elasticity of demand**, which measures how demand for a good changes with a change in income. More precisely, it is defined as percent change in demand for a good divided by percent change in income.

Consider the income elasticity of demand for primary school education. What sign do you expect income elasticity to have? Choose the best answer.

- Negative, since elasticity is always a negative quantity.
- Negative, since if a family spends more money on primary school education, this uses a greater amount of income.
- Positive, since if a family spends more money on primary school education, this uses a greater amount of income.
- ✔ Positive since if income increases, a family is able to spend more on primary school education.
- None of the above.

Explanation

We expect that an increase in income would result in an increased demand for primary school education, and vice-versa. Based on this, we expect the sign of income elasticity of demand to be positive: a positive percent change in income would mean a positive percent change in demand. On the other hand, a negative percent change in income would mean less money available to spend on education, so a negative percent change in demand for education. This also means we expect the demand versus income curve to be increasing.

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Answers are displayed within the problem

Question 2

1/1 point (graded)

Below is a table of price elasticity of demand for rice in several different countries.

Country	**Elasticity**
Austria	-0.47
Bangladesh	-0.8
China	-0.8
Japan	-0.25
United States	-0.55

Source: Perloff, J. (2008), Price Elasticity of Demand (Wikipedia)

In which country would a 1% change in price cause the smallest percentage change in sales of rice?

- [ ] A. Austria
- [ ] B. Bangladesh
- [ ] C. China
- [x] D. Japan ✔
- [ ] E. United States

✔

Explanation

A low absolute value for elasticity corresponds to a small percent change in demand for a given percent change in price. In Japan there would be a 0.25 percent decrease in demand in response to a 1% change in price. In Bangladesh and China, there would be a 0.8 percent decrease in demand in response to a 1% increase in price. So the percent change in demand would be smallest in Japan.
Source: Perloff, J. (2008), https://en.wikipedia.org/w/index.php?title= Price_elasticity_of_demand

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Answers are displayed within the problem

Question 3

1/1 point (graded)

Suppose that the point price elasticity of demand for a good is constant and equal to -0.5. Which of the following best explains what this means?

- For a one percent increase in price, the decrease in demand will always be approximately 5 percent.
- For a one percent increase in price, the percent decrease in demand will always be approximately 0.5 percent. ✔
- For a 5 percent increase in price, the decrease in demand will always be approximately one percent.
- For a 0.5 percent increase in price, the decrease in demand will always be approximately 5 percent.

Explanation

The price elasticity of demand equals the ratio between the percent change in demand and the percent change in price. So for a good with an elasticity of −0.5, a 1 percent increase in price would lead to a −.5 percent decrease in demand.

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Answers are displayed within the problem

Question 4: Think About It...

1/1 point (graded)

One of the benefits of the point price elasticity formula is that we can use it to easily compare elasticity at different price points on the same price-demand curve. In Boston, the linear model we used is: $q = -29p + 166$, where demand (q) is measured in millions of riders. Since the derivative of a line is its slope, -29 here, the point price elasticity of demand is:

$$E(p) = \text{Point Price Elasticity of Demand} = q'(p) \cdot \frac{p}{q} = \frac{-29 \cdot p}{-29p + 166}$$

Graph the elasticity function by hand or using Desmos.

Where is the vertical asymptote and what is its meaning in terms of subway ridership in Boston?

What happens to elasticity as prices increase? What does this mean?

Note: At this time, the text entry box for reflective questions does not support the percent symbol "%" - please type out the word "percent" if you need to refer to percents.

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Vertical asymptote at 166/29: point where elasticity goes
from negative to positive.
if price is increased beyond that point the demand will
start increasing with increasing price.
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✔

Thank you for your response.

Explanation

There is a vertical asymptote at $p = 166/29 \approx 5.72$. This is where the demand $q(p) = -29p + 166$ is zero. So $p = 5.72$ dollars is the approximate price when people will stop riding the subway in Boston, according to this model.

Point price elasticity becomes more negative as prices increase. To interpret this, remember that point price elasticity is approximately the percent change in demand for very small changes in price. So here this percent change in demand is getting much larger as the prices increase. This fits with what we expect as the prices reach the threshold where people stop riding the subway.

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Answers are displayed within the problem

Question 5

1/1 point (graded)

If we use a decreasing and linear function as a continuous model of demand for a good, what assumption(s) are we making?

- [ ] A. An increase in price causes an increase in demand.
- [x] B. An increase in price causes a decrease in demand. ✔
- [x] C. The same change in price causes the same change in demand regardless of the current price. ✔
- [ ] D. The same percent change in price causes the same percent change in demand regardless of the current price.
- [ ] E. None of the above.

✔

Select all that apply

Explanation

When we use a decreasing function to model demand, we are assuming that an increase in price leads to a decrease in demand. This is usually, but not always, a valid assumption.

When we use a linear function to model demand, we are assuming that the slope of the demand curve is constant (lines have constant slope). So the rise over run, or change in demand per unit change in price, is the same regardless of price.

When we modeled demand for the Boston subway we used a decreasing linear function to model demand. In this case, the function for point price elasticity of demand is not linear. If we use a linear function to model demand we should not expect the same percent change in price to cause the same percent change in demand.

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Answers are displayed within the problem

Question 6

1/1 point (graded)

Remember that point price elasticity is

$$\text{Point Price Elasticity of Demand} = q'(p) \cdot \frac{p}{q}.$$

Choose the statement which is true for any demand function $q(p)$.

- If the demand curve is decreasing, point price elasticity is always decreasing.
- If the demand curve is decreasing, point price elasticity is always negative. ✔
- Point price elasticity is equal to the derivative of the demand curve.
- If the demand curve is a line, point price elasticity is constant.
- None of the above.

Explanation

The derivative of the demand curve measures the (instantaneous) rate of change of demand with respect to price.

Choice (a) is incorrect. As we saw for the Boston model, point price elasticity can increase as price is higher.

Choice (b) is correct. If $q(p)$ is decreasing, then its derivative is always negative, so $q'(p) < 0$ for all p-values. Also note that $\frac{p}{q} > 0$ (since it's a ratio of price and demand, both of which are positive). So elasticity, defined as $q'(p) \cdot \frac{p}{q}$, is negative.

Choice (c) is incorrect. We can see this again from the Boston model where the elasticity is -0.1 for $p = 0.5$ and -0.2 for $p = 1$. While the derivative certainly has something to say about how demand will change with a change in price at any given point, it does not take into account the relative change, that is, the change relative to the current price or demand level. This is different than point price elasticity which essentially measures the **percent** change in demand (the change relative to the current demand) with respect to a **percent** change in price, when the percent change in price is very small.

Choice (d) is incorrect, again looking at the Boston linear model for demand. The slope of that line is constant (it's a line!) but the elasticity changes, from -0.1 for $p = 0.5$ to -0.2 for $p = 1$.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Question 7

1/1 point (graded)

Suppose that demand for subway tickets is well-modeled by $q(p) = \frac{2000}{p^3}$ on the domain $[2, 5]$ where p is in dollars and q is number of tickets sold.

Compute the point price elasticity for this demand function, and based on your answer, choose the best option for increasing revenue from selling tickets.

- No matter the current price, to increase revenue, we should increase prices.
- No matter the current price, to increase revenue, we should decrease prices. ✔
- It depends on what the current price is. At some price points, we should increase price to increase revenue, and at some price points we should decrease prices.
- None of the above.

Explanation

A: Elasticity is a constant value and it is −3. Since elasticity is greater than 1 in absolute value, this is an elastic situation. This means there is a greater percent change in demand than the percent change in price, so we should decrease prices and thus increase demand.

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Answers are displayed within the problem

Question 8

1/1 point (graded)

Consider the same demand function on the price domain $[2, 5]$. and the corresponding revenue function

$$R(p) = p \cdot q(p).$$

At what price point is revenue maximized? Choose the best option. (Does this match with your previous answer?)

- There is no maximum revenue. Since $R'(p) > 0$ for all values of p, we can always increase prices to get more revenue, according to our model. We should set the price at 5 dollars.

- There is no maximum revenue. Since $R'(p) < 0$ for all values of p, we can always decrease prices to get more revenue, according to our model. We should set the price at 0.01 dollars.
- There is no maximum revenue. Since $R'(p) < 0$ for all values of p, we can always decrease prices to get more revenue, according to our model. We should set the price at 2 dollars. ✔
- The maximum revenue occurs approximately at 3 dollars, since $R'(p) = 0$ when $p = 3$.
- None of the above.

Explanation

When demand is inelastic we raise prices to increase revenue. Here demand is elastic (with elasticity -3), so we lower prices to decrease revenue.} Since $q(p) = \frac{2000}{p^3}$, we have that $R(p) = p \cdot q(p) = p \cdot \frac{2000}{p^3} = \frac{2000}{p^2}$. So $R'(p) = -\frac{4000}{p^3}$. Since p is always positive, this means $R'(p)$ is always negative, thus revenue decreases as price increases. Therefore, to increase revenue, we want to decrease prices. The domain of prices is $[2, 5]$ so we would lower prices to 2 dollars. Notice this matches with the previous answer.

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Answers are displayed within the problem

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