1.4.4 Quiz: Point Price Elasticity Computations

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We just saw the formula for **Point Price Elasticity of Demand**. Here's a summary of what we did.

- We began with the formula for price elasticity between two points, computing percent change relative to the first point:

$$\text{Price Elasticity of Demand} = \frac{\Delta q}{q_1} \Big/ \frac{\Delta p}{p_1}.$$

- We rearranged this to see the average rate of change in this formula:

$$\frac{\Delta q}{q_1} \Big/ \frac{\Delta p}{p_1} = \frac{\Delta q}{\Delta p} \cdot \frac{p_1}{q_1}$$

- We used the fact that when δp is small, the average rate of change is approximately the derivative of the function $q(p)$ at that first point:

$$\frac{\Delta q}{\Delta p} \approx \frac{dq}{dp}\Big|_{p_1}$$

- This is made precise by taking a limit as the difference in price goes to zero. We get:

$$\text{Point Price Elasticity of Demand} = \frac{dq}{dp}\Big|_{p_1} \cdot \frac{p_1}{q_1}.$$

- We can also write this formula using the alternate 'prime' notation for derivative:

$$\text{Point Price Elasticity of Demand} = q'(p_1) \cdot \frac{p_1}{q_1}.$$

In this quiz, you'll get a chance to use this formula in the case of Boston and New York City.

Question 1

1/1 point (graded)

We made the approximation

$$\frac{\Delta q}{\Delta p} \approx \frac{dq}{dp}$$

.

which comes from the definition of the derivative of $q(p)$.

Which of the following is the correct definition of the derivative of $q(p)$?

- $q'(p) = \lim_{p \to 0} \frac{\Delta q}{\Delta p}$
- $q'(p) = \lim_{q \to 0} \frac{\Delta q}{\Delta p}$
- $q'(p) = \lim_{\Delta p \to 0} \frac{\Delta q}{\Delta p}$ ✔
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Question 2

0/1 point (graded)

Here are two linear models for the price and demand data in Boston and New York City.

Boston: $q = -29p + 166$

New York City: $q = -267p + 1195.$

Compute the point price elasticity at $p = 0.5$ for each city, rounding your answer to the nearest tenth. Use this to answer the following question.

When the price of a fare is 50 cents, if there is a very small change in price, we expect the percent change in ridership in Boston to be significantly greater than ▼ ✖**Answer:** about the same asthe percent change in ridership in New York.

Explanation

Given a demand function q, the formula for point price elasticity at the point (p_1, q_1) is $q'(p_1) \cdot \frac{p_1}{q_1}$. Since the derivative of a linear function is its slope, the point price elasticity for a line is the slope times $\frac{p_1}{q_1}$.

For Boston, the slope is -29. At $p = 0.5$, the demand is $q = 151.5$ so PPED at $p = 0.5 is - 29 \cdot \frac{0.5}{151.5} = -0.1$, rounded to the nearest tenth.

For New York, the slope is -267. At $p = 0.5$, the demand is $q = 1061.5$ so PPED at $p = 0.5$ is $-267 \cdot \frac{0.5}{1061.5} = -0.1$, rounded to the nearest tenth.

The point price elasticity in Boston is about the same as in New York, at the 50 cents price point. This means for a small change in price, the percent change in ridership in Boston will likely be about the same as the percent change in ridership New York. (Remember that elasticity is just ratio of the percent change in demand to the percent change in price.)

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

Question 3: Think About It...

1/1 point (graded)

Does your answer to the previous question match with what happened in New York and Boston when there was a price change from 50 to 75 cents. If so, how? If not, why do you think it might not agree?

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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For a small change in price, the percent change in
ridership in Boston will likely be about the same as the
percent change in ridership New York.
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Thank you for your response.

Explanation

No, it does not match because when prices went from 50 to 75 cents, Boston experienced a significantly greater percent change in ridership than New York.
This is in contrast to the point price elasticity at 50 cents which predicts that the percent change in ridership in Boston will be about the same as the percent change in ridership New York.
One reason the point price elasticities do not match what actually happened is that they are point price, meaning they make sense for capturing what happens for very small price changes. In the case of Boston and New York, the change from 50 to 75 cents was a large price change, relative to the price of a fare.

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Answers are displayed within the problem

Question 4

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.

Using the linear model for Boston, $q = -29p + 166$, would you expect consumers to react more to a price change when the fare is fifty cents or 1 dollar? In other words, is demand in Boston more elastic at $p = 0.5$ or $p = 1$? Answer this by comparing the **absolute value** of the point price elasticity of demand at $p = 0.5$ and $p = 1$.

- We expect consumers to react more to a price change when fare is fifty cents, compared to fare being one dollar, since demand is more elastic at $p = 0.5$ than $p = 1$ $(|E(0.5)| > |E(1)|)$

- [x] We expect consumers to react more to a price change when fare is a dollar, compared to fare being fifty cents, since demand is more elastic at $p = 1$ than $p = 0.5$ ($|E(1)| > |E(0.5)|$) ✔

- [ ] The elasticity of demand is the same at $p = 1$ and $p = 0.5$($|E(1)| = |E(0.5)|$)

Explanation

With demand modeled by the linear function $q = -29p + 166$, the point price elasticity at p is $E(p) = \frac{-29 \cdot p}{-29p+166}$. When $p = 0.5$, the elasticity $E(0.5) = -0.1$, rounded to the nearest tenth. When $p = 1$, the elasticty $E(1) = -0.2$. This means $|E(1)| > |E(0.5)|$, so we expect consumers to react more to a price change when fare is a dollar, compared to fare being fifty cents.

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

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