

Reminder

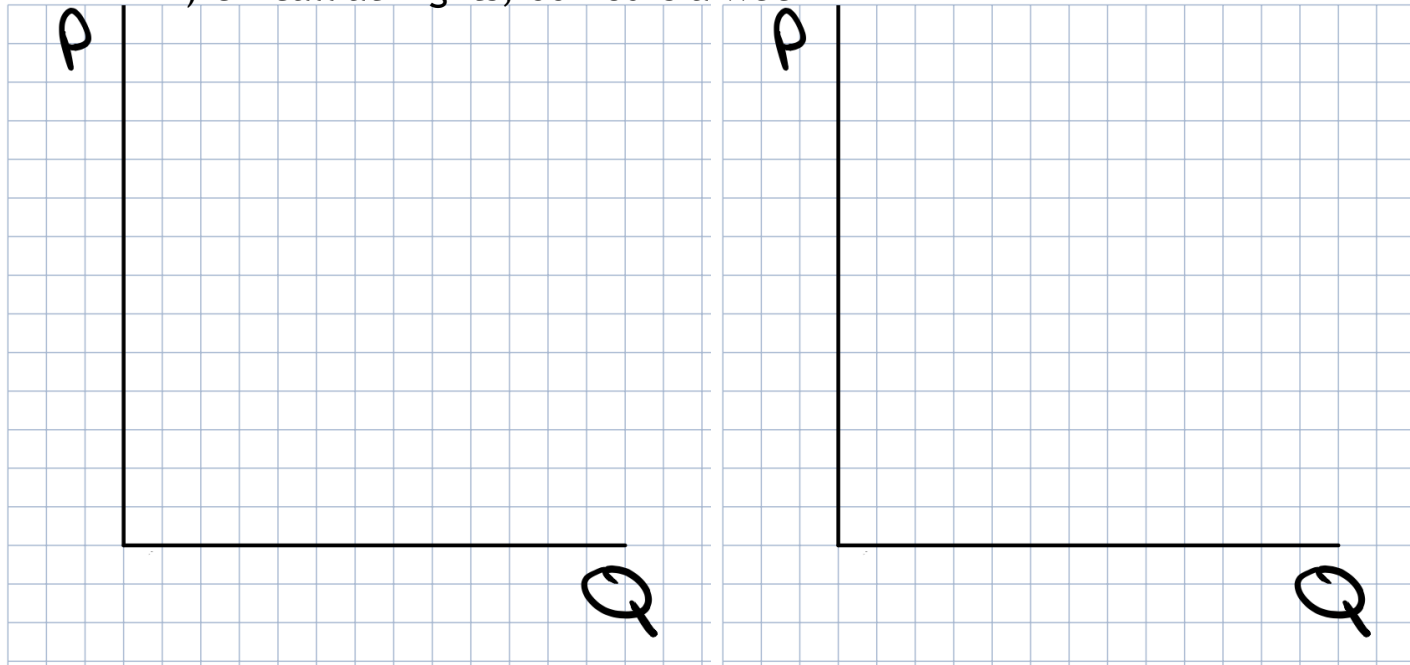
- ▶ Midterm 1 Modules 1-4 (2/12 in class)
 - ▶ Best review is tophat questions, quizzes, and CL questions
 - ▶ Topics for review available now
 - ▶ Read how to “use” topics for review
- ▶ Calculator
 - Non-Graphing
- ▶ Sample exam ~~Posted later this week~~ (by Friday 2/6)
 - ▶ “Best” way to use a practice exam
 - ▶ Not for studying concepts
 - ▶ For checking which concepts you need to study
 - ▶ Take it in test conditions, after you have done most of your studying

≈ PENCIL



Some Supply and Demand Applications

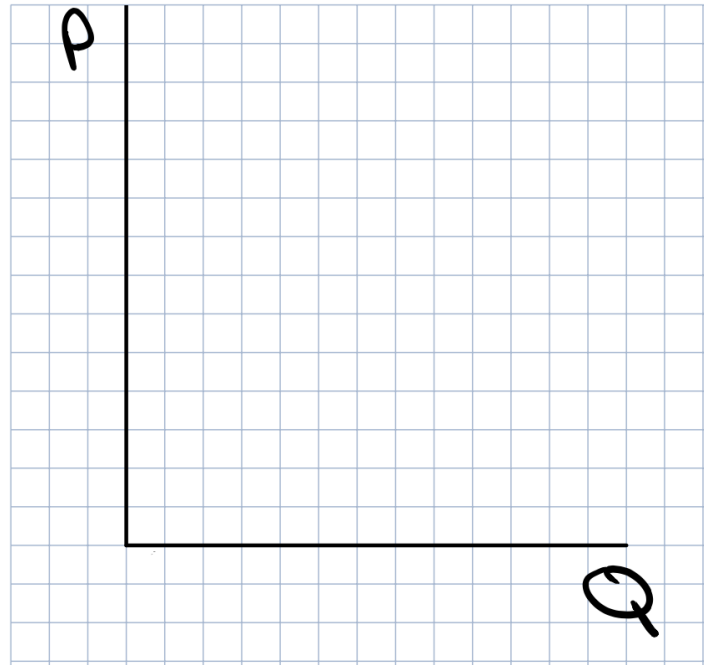
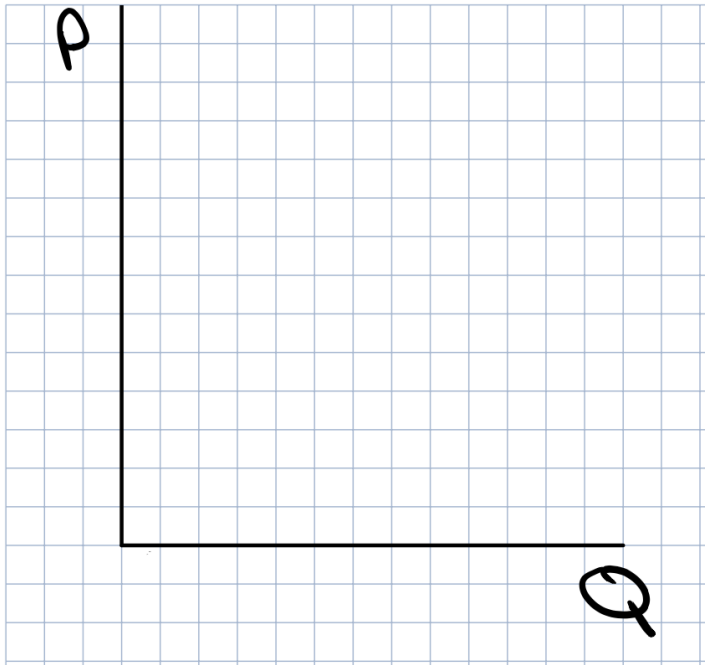
- Imagine 2 Jobs with identical demand
- Job hours differ, require same qualifications
 - A) 9-5 40 hours a week
 - B) On call at nights, 60 hours a week





Some Supply and Demand Applications

- Supply of College educated workers
- Supply of High-School educated workers
- Effect Microchip Revolution



Elasticity of Demand

How far does the rubber band fly?

Questions Elasticity Helps to Answer

- ▶ How do consumers change their buying behavior in response to a change in prices?
 - ▶ Price elasticity of demand
 - ▶ Will also think of income changes, changes in other good's prices
- ▶ Do we “undervalue” teachers compared to sports stars?
- ▶ What are the effects of different types of policies aimed to reduce illicit drug use?



Elasticity

- ▶ When you stretch a rubber band how far will it fly?
- ▶ When you drop a superball, how high will it bounce?
- ▶ When you increase or decrease the price of a good, how much less or more do consumers purchase?



Relative levels of elasticity

- ▶ More Elastic, can hit your friend with the rubber band from across the room
 - ▶ Quantity demanded changes a relatively large amount when you change prices
- ▶ Less Elastic (Relatively More Inelastic), not much snap when you stretch it
 - ▶ Not much of a change in buying behavior when you change prices

Some Example Goods

Gas

Water Necessities

Food

Medicine

Coffee

Substitutes

Specificity

Uber

Gas

Soda. Luxuries

Fast food

Movie tickets

Espresso



Less Elastic
(More Inelastic)

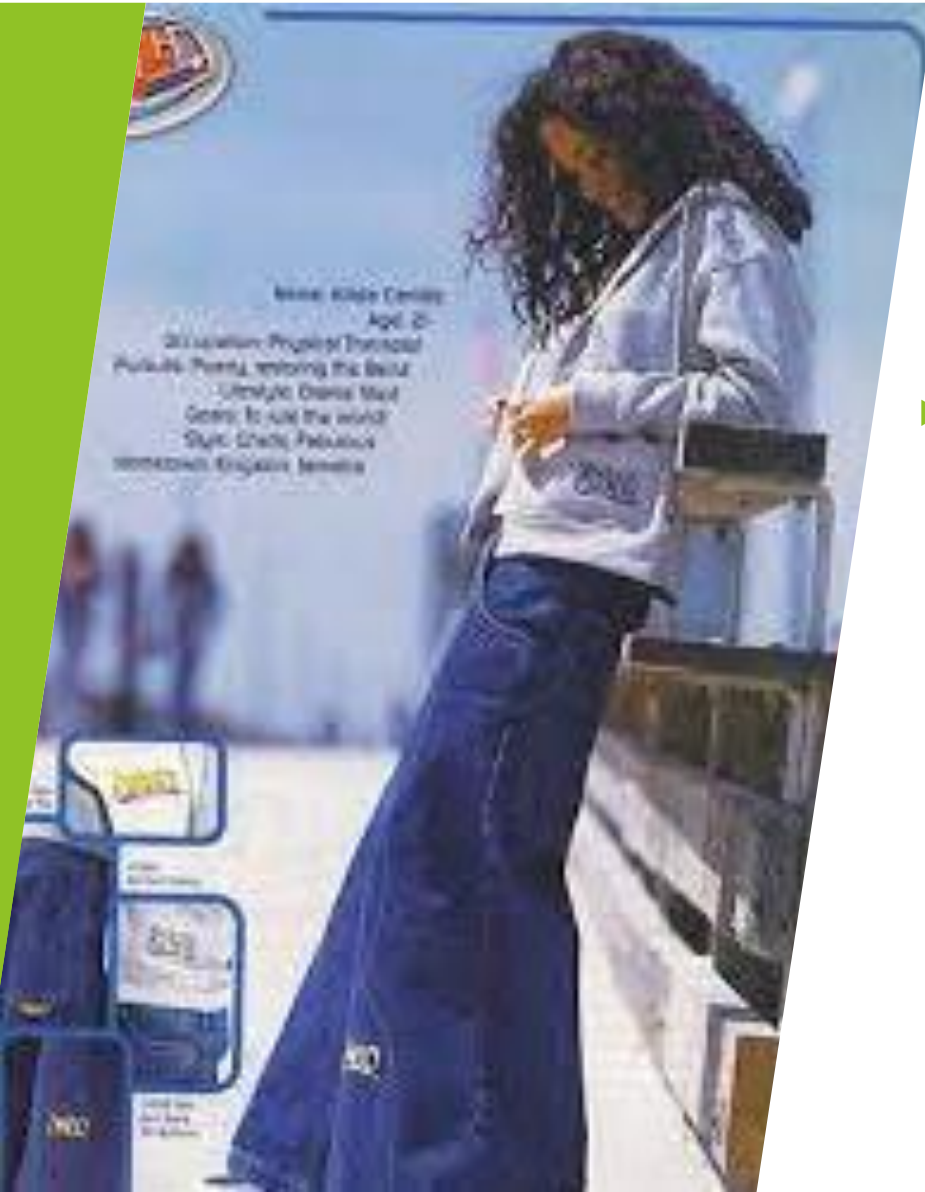
More Elastic
(Less Inelastic)



Determinants of Elasticity

- ▶ Availability of Close Substitutes
 - ▶ Only 2 emergency epinephrine devices on the market
 - ▶ Many brands of Ibuprofen
 - ▶ Even more brands of NSAIDs,
 - ▶ Even more of “Pain Relievers”
 - ▶ If price goes up and you have another “close” option, switch
 - ▶ More elastic with more close substitutes
 - ▶ Many of the determinants related to this idea





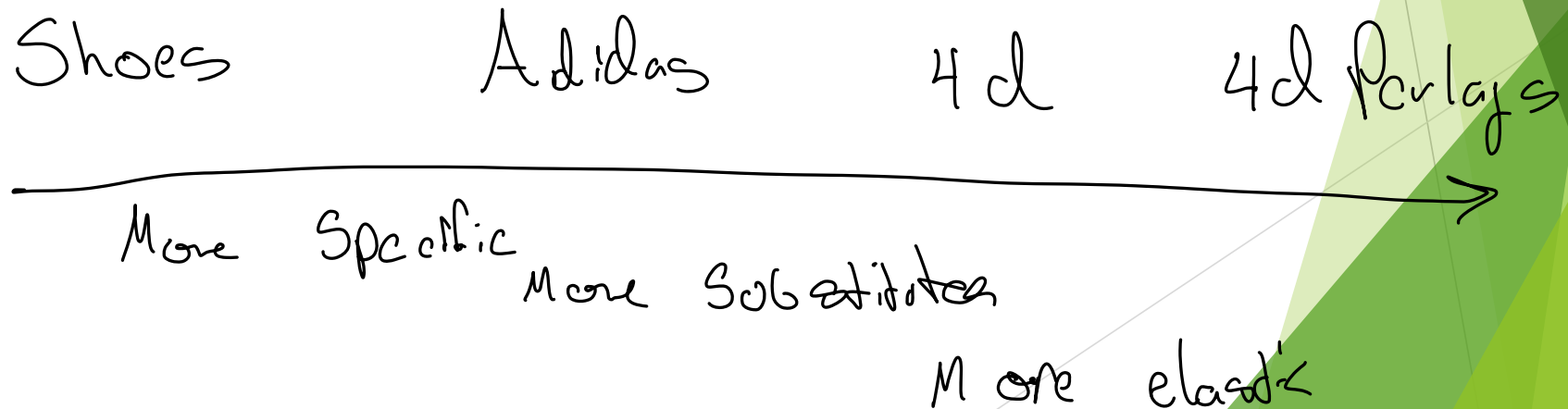
Determinants of Elasticity

► Necessities Vs. Luxuries

- Pants are a necessity for many people
- Specific high-end jeans a luxury
- Many of us “need” pants
 - Price increase, still have to buy them
 - Less elastic for necessities than luxuries

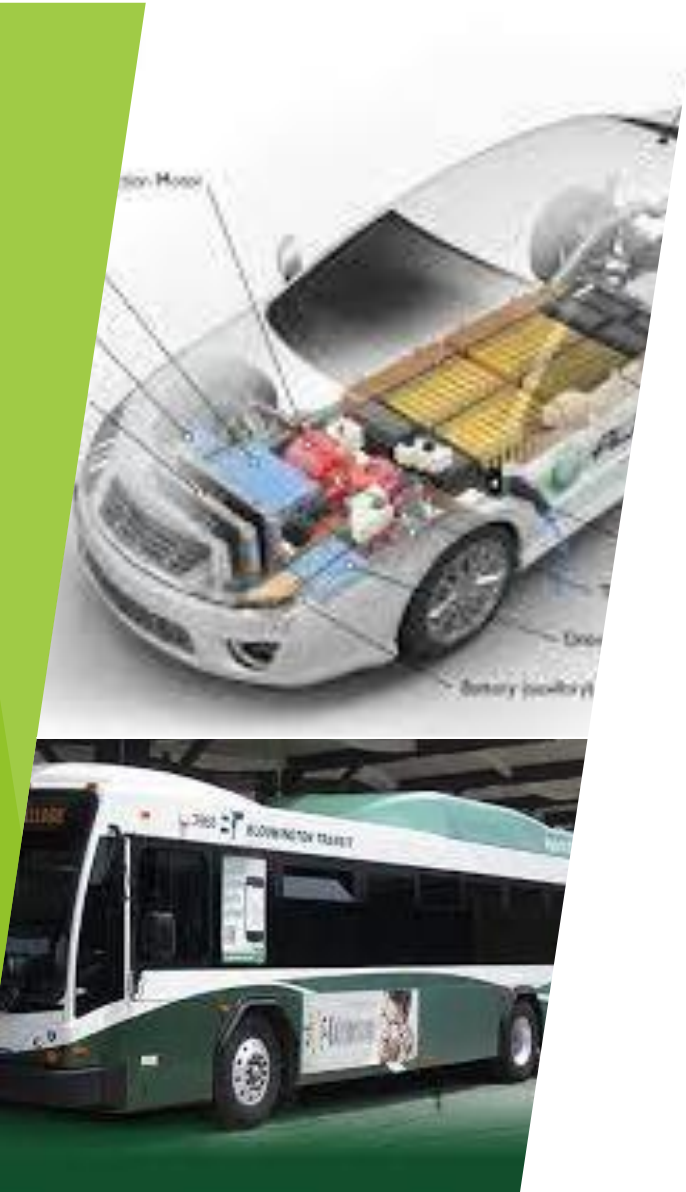
Definition (Scope) of the Market

- ▶ Can define a “market” with different boundaries
 - ▶ A demand for footwear (a necessity)
 - ▶ A demand for a specific colorway of a specific sneaker
 - ▶ More close substitutes
 - ▶ More elastic the more specific the market



Time Horizon

- ▶ How long does it take for the price to increase
 - ▶ Price of gas goes up 20% the day of your job interview
 - ▶ Need to get there, few substitutes day of
 - ▶ Price of gas goes up 20% over a year
 - ▶ Can get a bus pass, bike, electric car
 - ▶ More elastic over longer time horizons

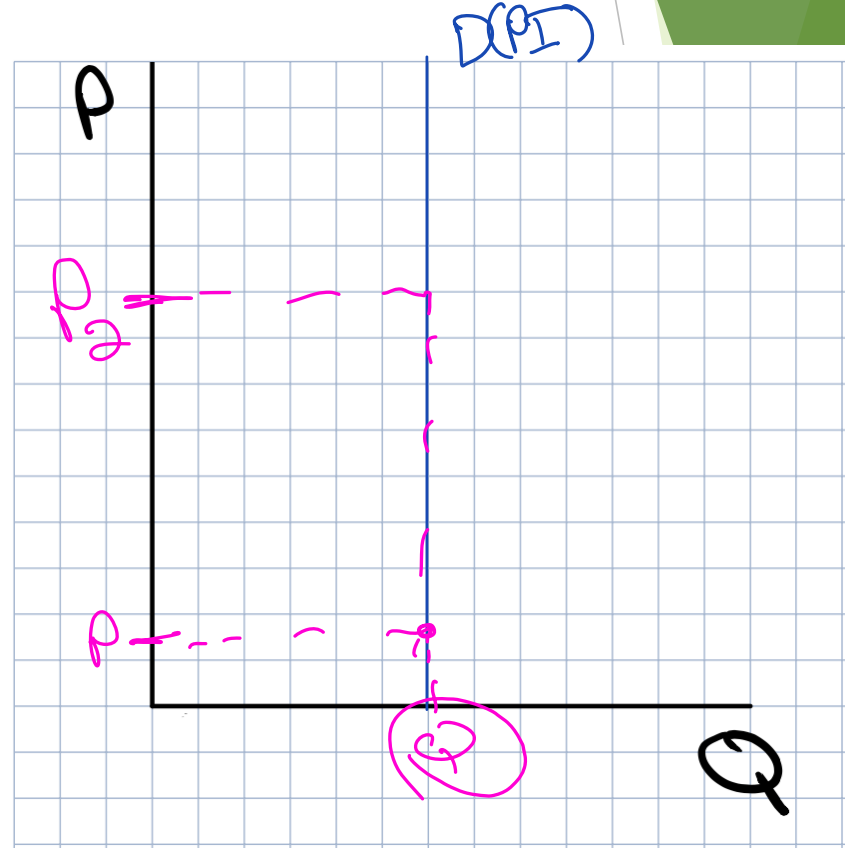


Portion of Income

- ▶ If something is a very small percentage of income
 - ▶ Hardly notice if price goes up
 - ▶ Salt, pencils
- ▶ If something is a very large percent of income
 - ▶ Cannot afford a large percentage change in price
 - ▶ Rent

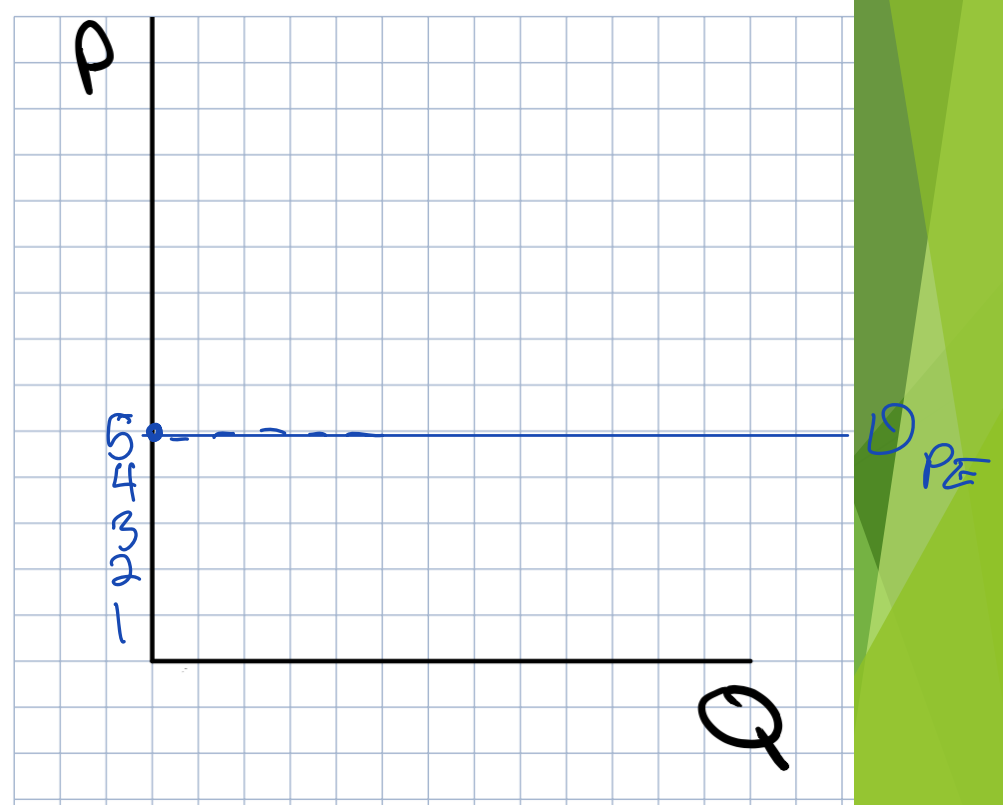
Using the supply and demand graph

- ▶ Can think about relative levels of elasticity
 - ▶ More Elastic (less inelastic), relatively larger response to a change
 - ▶ Less Elastic (more inelastic), relatively smaller response to a change
- ▶ Perfectly Inelastic



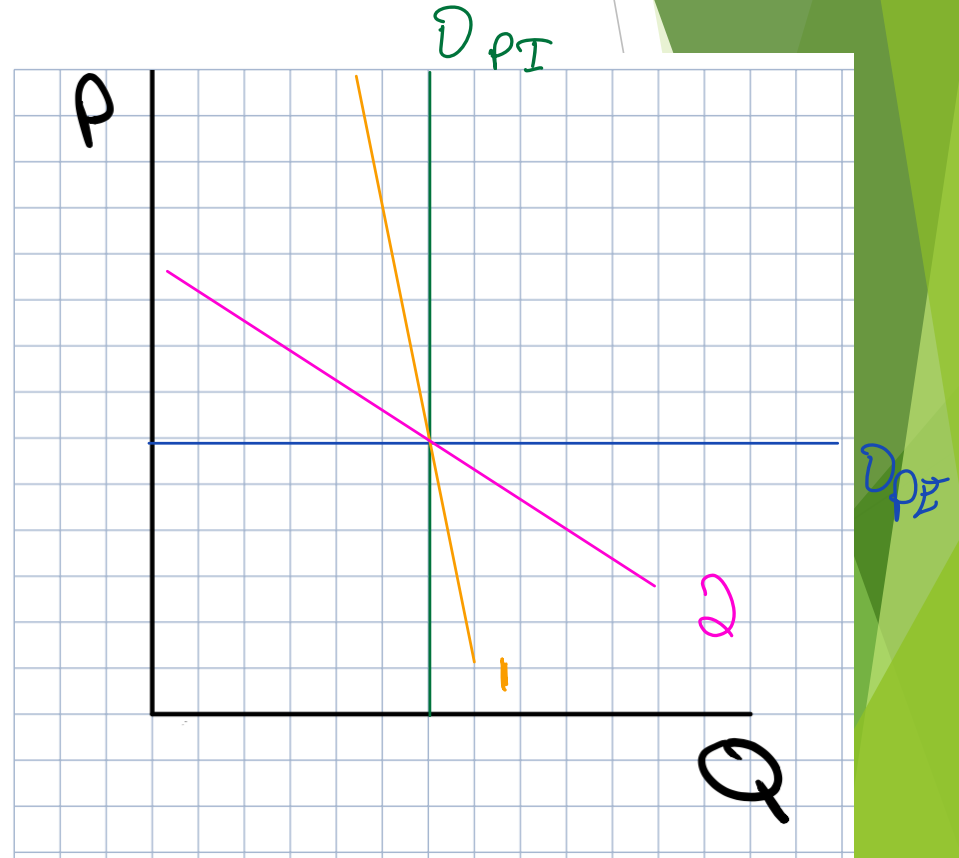
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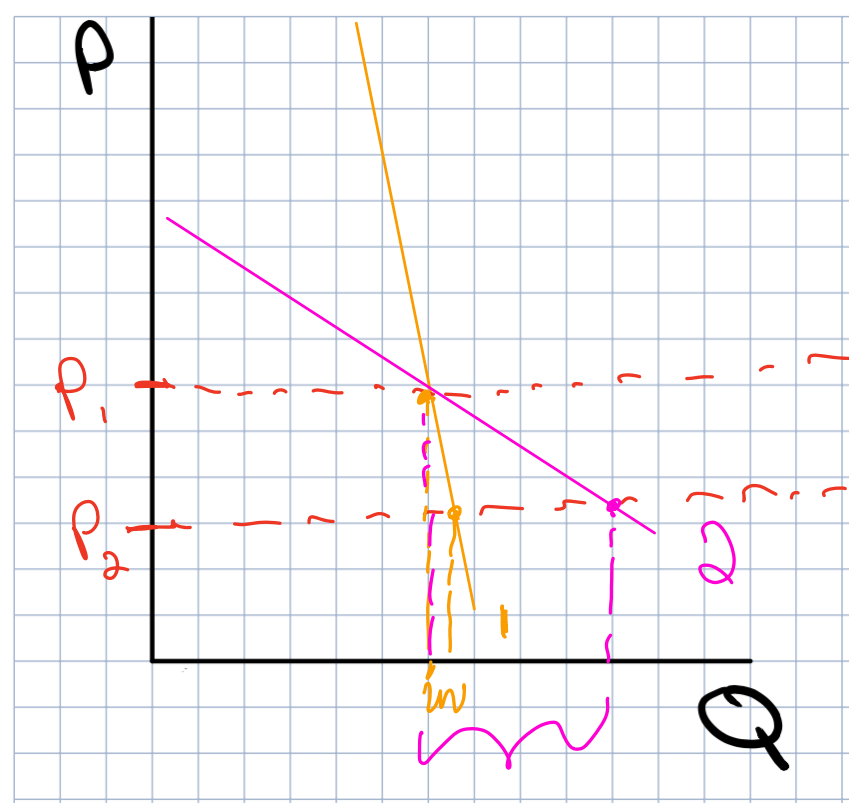
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Using the supply and demand graph

- Can think about relative levels of elasticity
 - More Elastic (less inelastic), relatively larger response to a change
 - Less Elastic (more inelastic), relatively smaller response to a change



Elasticity of Demand Percent Change VS. Midpoint Formula

▶ Percent Change

▶ Elasticity of Demand=

$$\left| \frac{\frac{\text{New Quantity} - \text{Original Quantity}}{\text{Original quantity}}}{\frac{\text{New Price} - \text{Original Price}}{\text{Original Price}}} \right|$$

- ▶ Best for “application” type questions

▶ Midpoint

▶ Elasticity of Demand=

$$\left| \frac{\frac{\text{New Quantity} - \text{Original Quantity}}{(\text{Original quantity} + \text{New quantity})/2}}{\frac{\text{New Price} - \text{Original Price}}{(\text{Original Price} + \text{New Price})/2}} \right|$$

- ▶ Removes “directional” issue

- ▶ Any question will say “Using percentage change method” or “Using midpoint method”



Percent Change

- ▶ Percent change = $\text{Change in value} / \text{Original value}$
 $= (\text{New value} - \text{Old value}) / (\text{Old value})$
This gives “decimal form”
Multiply by 100 for “percent form”
- ▶ Yesterday was 40 degrees Fahrenheit, today is 30 degrees Fahrenheit

Percent form





Percent Change

- ▶ Percent change=Change in value/Original value
=(New value-Old value)/(Old value)
- ▶ Yesterday was 40 degrees Fahrenheit, today is 30 degrees Fahrenheit
- ▶ $(30-40)/40 = -10/40 = -.25 = -25\%$

Percent Change

- ▶ Percent change = $\text{Change in value} / \text{Original value}$
 $= (\text{New value} - \text{Old value}) / (\text{Old value})$
- ▶ Yesterday was 40 degrees Fahrenheit, today is 30 degrees Fahrenheit
- ▶ Reverse this and it can change sign and magnitude
- ▶ Yesterday was 30 degrees Fahrenheit, today is 40 degrees Fahrenheit

- ▶ $(40 - 30) / 30 = 10 / 30 = .33 = 33\%$

Calculating Elasticity with Percentage Changes: Calculations

Calculating Elasticity

The formula for calculating elasticity is:

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

Example: For every 10 percent increase in the price of a pack of cigarettes, the quantity of cigarettes demanded decreases 7 percent. Using the formula, we get:

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$
$$= \left| \frac{-7\%}{10\%} \right| = |-0.7| = 0.7$$



Calculating Elasticity with Percentage Changes: Calculations

- ▶ Why do I include this one?
 - ▶ Better for real world applications
- ▶ You see a study that the elasticity of demand is .7
 - ▶ Boss wants to know what happens if they have a sale 10% off

$$\begin{array}{lcl} E_d = \left| \frac{\% \Delta Q}{\% \Delta P} \right| & 10\% \cdot .7 = & \left| \frac{\% \Delta Q}{\cancel{-10\%}} \right| \\ .7 = \left| \frac{\% \Delta Q}{-10\%} \right| & 7\% = & \left| \frac{\% \Delta Q}{\cancel{-10\%}} \right| \end{array}$$



Calculating Elasticity with Percentage Changes: Calculations

- ▶ Why do I include this one?
 - ▶ Better for real world applications
- ▶ You see a study that the elasticity of demand is .7
 - ▶ Currently selling 100 units a week
 - ▶ Boss wants to know what happens if they have a sale 10% off

$$.7 = |x / .1|$$

$$.07 = |x|$$

$$.07 = |\text{percent change in quantity}|$$

"We'll sell 7 more units"

Calculating Elasticity with Percentage Changes: Calculations

- ▶ Price Elasticity of Demand would always be negative without absolute value
 - ▶ Why?
 - ▶ Report as positive
 - ▶ Absolute value

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

Calculating Elasticity with Percentage Changes: Calculations

- ▶ If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units
 - ▶ What is the price elasticity of demand? (using percentage change)

$$\text{Price Elasticity of Demand} = \frac{\text{percent change in quantity}}{\text{percent change in price}}$$

Calculating Elasticity with Percentage Changes: Calculations

- ▶ If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units

- ▶ What is the price elasticity of demand? (using percentage change)

- ▶ $|[(10-20)/20]/[(\$4-\$3)/\$3]| =$
 $|(-10/20)/(1/3)| =$
 $|(-1/2)/(1/3)| =$
 $|-3/2| = 3/2$

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

Calculating Elasticity with Percentage Changes: Calculations

- ▶ If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units
 - ▶ What is the price elasticity of demand?
- ▶ Now reverse directions

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

Calculating Elasticity with Percentage Changes: Calculations

- ▶ If Price decreases from \$4 to \$3 & Quantity Increases from 10 units to 20 units

- ▶ What is the price elasticity of demand?

- ▶ $|[(20-10)/10]/[(\$3-\$4)/\$4]| =$
 $| (10/10)/(1/4) | =$
 $| (1)/(-1/4) | =$
 $| -4 | = 4$

Price Elasticity of Demand =

$$\left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

Calculating Price Elasticities Using the Midpoint Formula

$$\text{Midpoint percent change in quantity} = \frac{Q_2 - Q_1}{(Q_2 + Q_1) \div 2} \times 100$$

$$\text{Midpoint percent change in price} = \frac{P_2 - P_1}{(P_2 + P_1) \div 2} \times 100$$

The Midpoint Method : using the average percentage change in both quantity and price.

- ▶ There are two formulas used for the midpoint method; the midpoint percent change in quantity, and the midpoint percent change in price.
- ▶ The advantage of the midpoint method is that one obtains the same elasticity between two price points whether there is a price increase or decrease.



Calculating Price Elasticities Using the Midpoint Formula

$$\text{Midpoint percent change in quantity} = \frac{Q_2 - Q_1}{(Q_2 + Q_1) \div 2} \times 100$$

$$\text{Midpoint percent change in price} = \frac{P_2 - P_1}{(P_2 + P_1) \div 2} \times 100$$

- ▶ If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units
- ▶ What is the price elasticity of demand?

Calculating Price Elasticities Using the Midpoint Formula

- If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units

$$\text{Midpoint percent change in quantity} = \frac{Q_2 - Q_1}{(Q_2 + Q_1) \div 2} \times 100 \quad (10-20)/[(10+20)/2] = -10/15 = -2/3$$

$$\text{Midpoint percent change in price} = \frac{P_2 - P_1}{(P_2 + P_1) \div 2} \times 100 \quad (4-3)/[(4+3)/2] = 1/3.5$$

Calculating Price Elasticities Using the Midpoint Formula

$$\begin{aligned} |(-2/3)/(1/3.5)| &= \\ (2/3)/(2/7) &= \\ (2/3)*(7/2) &= \\ 7/3 &= 2.33 \end{aligned}$$

- If Price increases from \$3 to \$4 & Quantity Decreases from 20 units to 10 units

$$(10-20)/[(10+20)/2] = -10/15 = -2/3$$

$$(4-3)/[(4+3)/2] = 1/3.5$$

Elasticity of Demand Percent Chang VS. Midpoint Formula

► Percent Change

► Elasticity of Demand =
$$\left| \frac{\frac{\text{New Quantity} - \text{Original Quantity}}{\text{Original quantity}}}{\frac{\text{New Price} - \text{Original Price}}{\text{Original Price}}} \right|$$

- Best for “application” type questions

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$$\left| \frac{\frac{\text{New Quantity} - \text{Original Quantity}}{(\text{Original quantity} + \text{New quantity})/2}}{\frac{\text{New Price} - \text{Original Price}}{(\text{Original Price} + \text{New Price})/2}} \right|$$

- Removes “directional” issue

- Any question will say “Using percentage change method” or “Using midpoint method”

Table 1. Three Categories of Elasticity: Elastic, Inelastic, and Unitary

If...	Then...	And it's called...
% change in quantity is greater than % change in price	Computed elasticity is greater than 1	Elastic
% change in quantity is equal to % change in price	Computed elasticity is equal to 1	Unitary
% change in quantity is less than % change in price	Computed elasticity is less than 1	Inelastic

Price Elasticity of Demand and Total Revenue

$$\text{Price Elasticity of Demand} = \left| \frac{\text{percent change in quantity}}{\text{percent change in price}} \right|$$

- Total Revenue=Price*Quantity
- Demand Inelastic: Raise (Lower) Price

- Demand Elastic: Raise (Lower) Price

Income Elasticity

Income Elasticity of Demand

- ▶ The percentage change in quantity demanded divided by the percentage change in income.
- ▶ Sign matters

▶ Formula:

$$\text{income elasticity of demand} = \frac{\text{percent change in quantity demanded}}{\text{percent change in income}}$$

Income Elasticity

Income Elasticity of Demand

- ▶ The percentage change in quantity demanded divided by the percentage change in income.
- ▶ Sign matters
- ▶ Negative: Inferior
- ▶ Positive: Normal
 - ▶ Less than 1: Necessity
 - ▶ Greater than 1: Luxury

▶ Formula:

$$\text{income elasticity of demand} = \frac{\text{percent change in quantity demanded}}{\text{percent change in income}}$$

Cross-Price Elasticity

Cross-Price Elasticity of Demand

- ▶ Refers to the idea that the price of one good is affecting the quantity demanded of a different good.
- ▶ Sign matters

$$\text{cross-price elasticity of demand} = \frac{\text{percent change in } Qd \text{ of good } A}{\text{percent change in price of good } B}$$

Cross-Price Elasticity

Cross-Price Elasticity of Demand

- ▶ Refers to the idea that the price of one good is affecting the quantity demanded of a different good.
- ▶ Sign matters
- ▶ Positive: Substitutes
- ▶ Negative Complements

$$\text{cross-price elasticity of demand} = \frac{\text{percent change in } Qd \text{ of good } A}{\text{percent change in price of good } B}$$

Price Elasticity of Supply

Price elasticity of supply is the percentage change in the quantity of a good or service supplied divided by the percentage change in the price.

- ▶ Measures how much quantity supplied changes in response to a change in the price.
- ▶ Looks at how producers respond to a change in the price instead of how consumers respond.
- ▶ $\% \text{ change in quantity supplied} / \% \text{ change in price}$

Determinants of Elasticity of Supply

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Determinants of Elasticity of Supply

- ▶ Substitutability/Availability of inputs
 - ▶ Degree of decreasing marginal product (increasing marginal costs)