

Principles of Microeconomics

ECON202

Elasticity

Elasticity is a tool that is used to describe the relationship between two variables. It is defined as the percentage change in a dependent variable "caused" by a percentage change in an independent variable.

$$\text{Elasticity} = \frac{\% \Delta \text{ in a dependent variable}}{\% \Delta \text{ in an independent variable}}$$

While elasticity can be calculated and used for any two related variables there are four basic coefficients of elasticity used in principles of economics

- **"Own" price elasticity of demand** This is a measure of the percentage change in the quantity demanded "caused" by a percentage change in price. Because the demand function is an inverse relationship between price and quantity the coefficient of price elasticity will always be negative:

$$\text{Price elasticity of demand} = \frac{\% \text{ change in Quantity Demanded}}{\% \text{ change in price}}$$

- **Income elasticity**. It is used to describe how a change in buyers' income shifts the demand function for a good

$$\text{Income Elasticity} = \frac{\% \text{ change in Demand}}{\% \text{ change in Income}}$$

- **Cross elasticity** is a measure of the responsiveness of buyers of a good to changes in the prices of related goods.

$$\text{Cross elasticity} = \frac{\% \text{ change in the demand for good X}}{\% \text{ change in the price of good Y}}$$

- **Elasticity of Supply** is a measure of the responsiveness of sellers to changes in the price of a good.

$$\text{Elasticity of supply} = \frac{\% \text{ change in Quantity supplied}}{\% \text{ change in price}}$$

"Own" price elasticity of demand

The price elasticity of demand can be calculated at a specific price and quantity. This is called the point price elasticity and is different at every price. To calculate point price elasticity use the formula

$$\text{Point price elasticity} = E_P \text{ or } \varepsilon_P = \frac{\Delta Q}{\Delta P} * \frac{P_1}{Q_1}$$

$\frac{\Delta Q}{\Delta P}$ is the slope of the demand function

P_1 is the original price

Q_1 is the original quantity

The average price elasticity can be calculated between two price-quantity combinations. The average or "Arc" elasticity is calculated by the formula

$$E_P = \frac{\Delta Q}{\Delta P} * \frac{P_1 + P_2}{Q_1 + Q_2}$$

$\frac{\Delta Q}{\Delta P}$ is the slope of the demand function

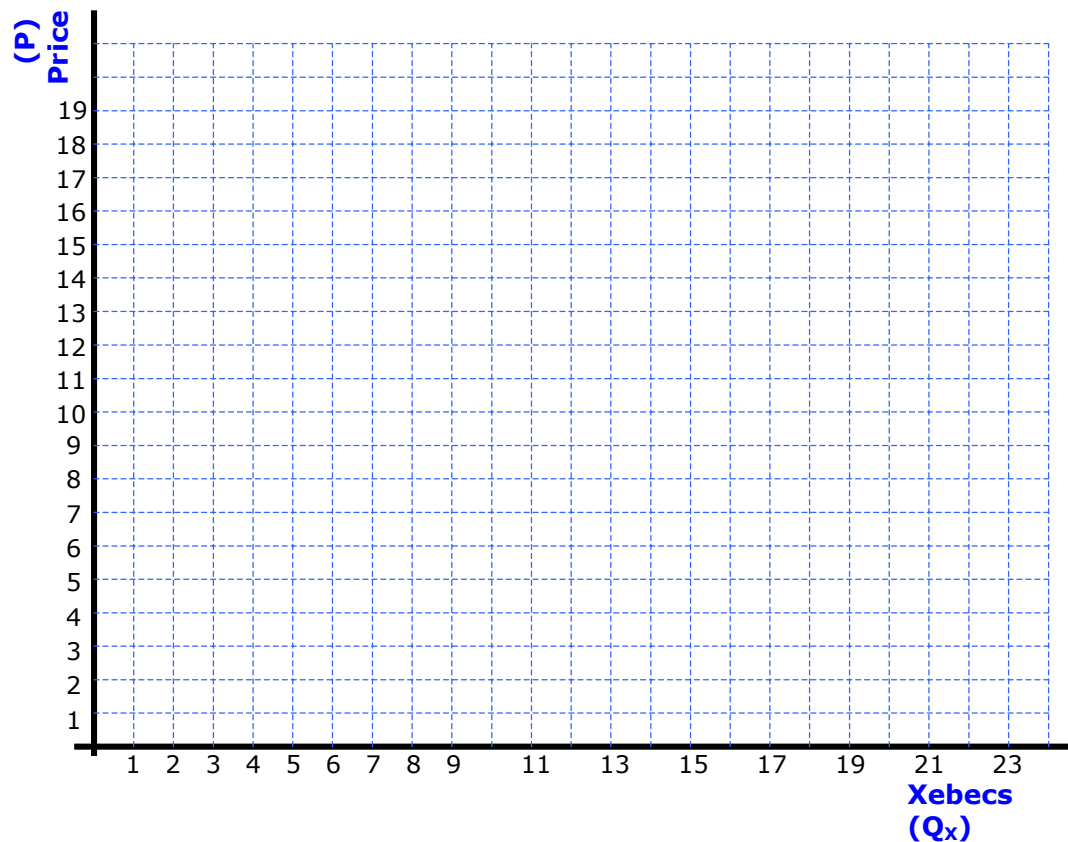
P_1 is the original price, P_2 is the new price

Q_1 is the original quantity, Q_2 is the new quantity

Questions and Exercises

Given the demand function $Q = 24 - 1.5P$

1. Construct the demand function on the graph.
2. Calculate the point price elasticity at a price of \$14
3. Calculate the point price elasticity at a price of \$8
4. Calculate the point price elasticity at a price of \$5
5. Calculate the arc elasticity between \$8 and \$14
6. Calculate the arc elasticity between \$5 and \$8
7. Calculate the arc elasticity between \$5 and \$14



An application of price elasticity of demand.

If the quantity demanded for milk were 100 units and the price elasticity of demand for milk was $-.6$. If the price of milk increased by 8%, how much would the quantity demanded change? Note, this does not imply equilibrium

Calculate the values for the demand function in Table 1

Demand Function $Q_x = 120 - 5P_x$					
Price (P_x)	Quan (Q_x)	TR	E_p	AR	MR
\$25.00					
\$24.00					
\$23.00					
\$22.00					
\$21.00					
\$20.00					
\$19.00					
\$18.00					
\$17.00					
\$16.00					
\$15.00					
\$14.00					
\$13.00					
\$12.00					
\$11.00					
\$10.00					
\$9.00					
\$8.00					
\$7.00					
\$6.00					
\$5.00					
\$4.00					
\$3.00					
\$2.00					
\$1.00					
\$0.00					