Unit 3. Elasticity

Quiz

1. If a 3 percent change in price leads to a 5 percent increase in the quantity supplied,

A. supply is unit elastic

B. the slope of the supply curve is less than one

C. the slope of the supply curve is greater than one

D. supply is elastic

E. supply is inelastic

The answer is D. $E_p^s = \frac{\Delta Q}{Q} / \frac{\Delta P}{P} = \frac{5}{3} > 1$.

2. Normal goods always have a/an

A. price elastic demand curve

B. price inelastic demand curve

C. price elastic supply curve

D. negative income elasticity of demand

E. positive income elasticity of demand

The answer is E. By definition the quantity of a normal good consumed goes up $\left(\frac{\Delta Q}{Q} > 0\right)$ with a rise in consumers' income $\left(\frac{\Delta I}{I} > 0\right)$. It follows that $E_I^d = \frac{\Delta Q}{Q} / \frac{\Delta I}{I} > 0$.

3. When the cross-price elasticity of demand is negative (the law of demand is valid), the goods in question are necessarily

A. normal

B. inferior

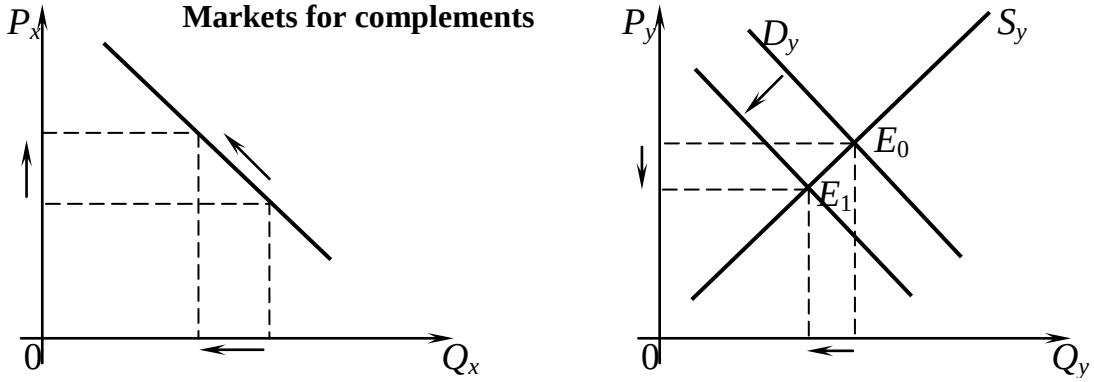
C. complements

D. substitutes

E. luxuries

The answer is C. By definition the goods are complements if their quantities change in one and the same direction: when quantity of a good goes up consumers increase the demand for the other one. And vice versa, a decrease in demand for a good pushes down consumption of the other one. Under the law of demand an upward movement of the price of a good *x* tends to decrease its consumption. As the good *y* is complementary for *x*, it

shifts demand curve for *y* inwards (towards the origin), and both its quantity and price go down (see the figure below). It follows that an increase in the price of a good pushes down consumption of its complement, so cross-price elasticity of demand for complementary goods is negative, as a rule[1].



4. Let's plot price at the vertical axis of a graph and quantity demanded at the horizontal axis. Price elasticity of demand is zero

A. in the intercept of linear demand curve with the horizontal axis

B. at every point of a horizontal demand curve

C. at every point of a hyperbolic demand curve

D. answers A and B are true

E. all of the above.

The answer is A. Let $P = a - bQ$, where a and b are constant numbers, be the linear demand curve. Use the inverse linear demand curve $Q = \frac{a}{b} - \frac{P}{b}$ and definition of price elasticity of demand to get:

$$E_p^d = \frac{dQ}{dP} \cdot \frac{P}{Q} = -\frac{P}{b\left(\frac{a}{b} - \frac{P}{b}\right)}.$$

Note that price elasticity of a power demand curve $Q = P^\alpha$ is constant and is equal to the power α:

$$E_p^d = \frac{dQ}{dP} \cdot \frac{P}{Q} = \frac{dP^\alpha}{dP}\frac{P}{P^\alpha} = \alpha P^{\alpha-1}\frac{P}{P^\alpha} = \alpha.$$

For instance, in the constant revenue case (*TR=PQ=const*), when demand curve is hyperbola: $Q = \frac{1}{P}$, it is unit-elastic regardless of quantity demanded (or price).

[1] The exception is the case of a Giffen good. It will be considered later, in unit 4.

5. If price elasticity of demand is greater than one in absolute value, it follows that

A. cutting down the product's price will reduce total expenditures of consumers
B. cutting down the product's price will raise total revenues of producers
C. 21 % change in price will cause 15% change in demand
D. answers A and C are correct
E. answers B and C are correct.

The answer is B. Total revenue of producers as a function of output can be expressed using price elasticity of demand:

$$MR = \frac{dTR}{dQ} = \frac{d}{dQ}(p(Q)Q) = p(Q) + \frac{dp(Q)}{dQ}Q$$
$$= p(Q)\left(1 + \frac{dp(Q)}{dQ} \cdot \frac{Q}{p(Q)}\right) = p(Q)\left(1 + E_q^d\right)$$
$$= p\left(1 + \frac{1}{\frac{dQ(p)}{dp} \cdot \frac{p}{Q(p)}}\right) = p\left(1 + \frac{1}{E_p^d}\right).$$

Here we have taken into account that derivatives of inverse functions $y = f(x)$ and $x = f^{-1}(y)$ are inverse values[2]: $\frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}$.

In case of elastic demand, when $E_p^d < -1, \left|E_p^d\right| > 1$, $\frac{dTR}{dQ} > 0$, and total revenue is an increasing function of the quantity of the good consumed: if *Q* goes up, *TR* grows as well.

[2] The same applies to elasticities of inverse functions – they are inverse values: $E_x^y = \frac{dy}{dx} \cdot \frac{x}{y} = \frac{1}{\frac{dx}{dy}\frac{y}{x}} = \frac{1}{E_y^x}$.

6. Assume a consumer finds that his total expenditure on compact disks stays the same after the price of compact disks declines, other things being equal. Which of the following is true for this price change?

A. Compact disks are inferior goods to this consumer

B. The consumer's demand for compact disks increased in response to the price change

C. The consumer's demand for compact disks is perfectly price elastic

D. The consumer's demand for compact disks is perfectly price inelastic

E. The consumer's demand for compact disks is unit price elastic

The answer is E. According to the derivative above, in case of unit elasticity of demand $\frac{dTR}{dQ} = 0$, and total revenue is at the maximum.

7. A tax is most likely to be paid by the seller when the:

A. demand is elastic and supply is inelastic.

B. demand is inelastic and supply is elastic.

C. tax is levied on the seller.

D. supply and demand are elastic.

E. supply and demand are inelastic

The answer is A. The ratio of tax burden of consumers and producers is equal to inverse ratio of the absolute value of the corresponding elasticities, i.e. to the ratio of elasticities of supply and demand taken with the sign "minus": $\frac{T_c}{T_p} = -\frac{E_s}{E_d}$. The more elastic demand is and the less elastic the supply is the greater is the share of the tax levied on producers as compared to that of consumers.

8. All else equal, a binding price floor will cause less of a surplus if:

A. both supply and demand are inelastic.

B. both supply and demand are elastic.

C. supply is elastic, but demand is inelastic.

D. supply is inelastic, but demand is elastic.

E. none of the above: A price floor won't cause a surplus.

The answer is A. If the curves are inelastic, they are relatively steep and the excess supply will be smaller.

9. Wayne's cross-price elasticity of demand for peanuts with respect to the price of bananas is -0,44. This means that, for Wayne, peanuts and bananas are _____ and that a reduction in supply of bananas would cause _____ his peanut demand curve.

A. Complements; a rightward shift of

B. Complements; a movement along

C. Complements; a leftward shift of

D. Substitutes; a rightward shift of

E. Substitutes; a leftward shift of

The answer is C. Negative cross-price elasticity implies that the goods are complements; thus, if the quantity demanded of bananas fell, the demand for peanuts would also be lower.

10. Demand for a good is likely to be more elastic:

A. the smaller the fraction of consumer income absorbed by the good

B. in the short run than in the long run

C. the more broadly defined the good

D. the greater the number of available substitutes for the good

The answer is D. The greater the number of substitutes - if the price rises, you can easily buy something else.