

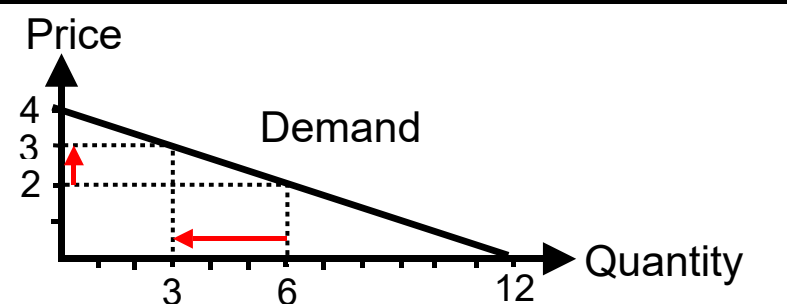
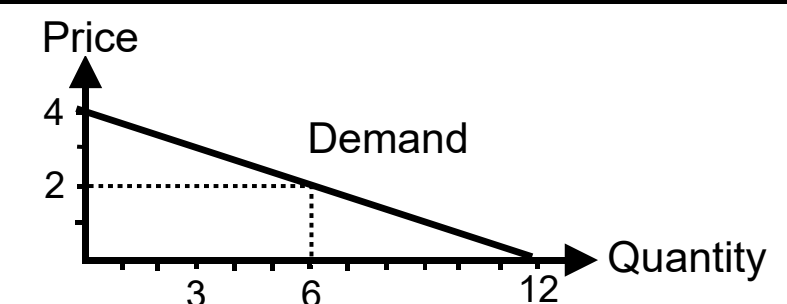
# Arc and point elasticity

The following explanations refer to the **price elasticity of demand** (e).

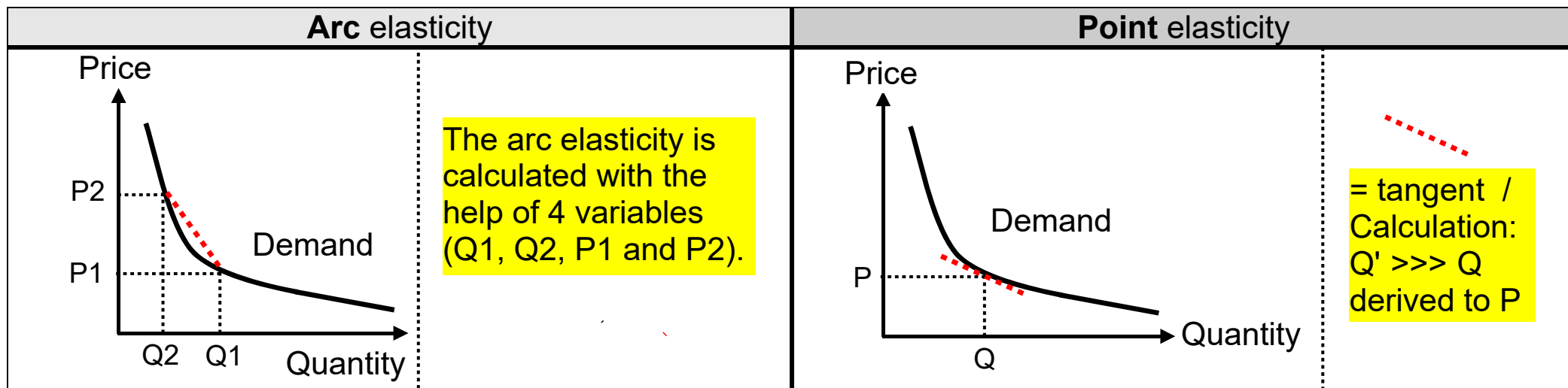
**1 Formulae** (Q = Quantity; P = Price; P1 and Q1 are initial values, P2 and Q2 are final values.)

Arc elasticity	Point elasticity
$e = \frac{\Delta Q}{Q_1} : \frac{\Delta P}{P_1} = \frac{\Delta Q}{\Delta P} * \frac{P_1}{Q_1} // \Delta Q = Q_2 - Q_1 / \Delta P = P_2 - P_1$	$e = \frac{dQ}{Q} : \frac{dP}{P} = \frac{dQ}{dP} * \frac{P}{Q} \quad / \quad \frac{dQ}{dP} = Q' \text{ (1. derivation)}$

**2 Example of a linear demand function: Q = 12 - 3P**

Arc elasticity: P rises from 2 to 3	Point elasticity: e at P = 2
	
$e = \frac{\Delta Q}{\Delta P} * \frac{P_1}{Q_1} = \frac{-3}{1} * \frac{2}{6} = -1$ <p>Average values can be used instead of P1 and Q1, for example '(P1 + P2) : 2' and '(Q1 + Q2) : 2'.</p>	$Q = 12 - 3P \rightarrow Q' = -3$ $e = \frac{dQ}{dP} * \frac{P}{Q} = -3 * \frac{2}{6} = -1$
<p><b>Remark:</b> In the case of a <b>linear</b> demand function, the two elasticities produce the <b>same</b> result.</p>	

### 3 Example 1 of a non-linear demand function: in general



### 4 Example 2 of a non-linear demand function: $Q = 36 - P^2$

Arc elasticity	Point elasticity
P falls from 5 to 3	e at P = 5
P1 = 5 → Q1 = 36 - P <sup>2</sup> = 36 - 25 = 11	Q = 36 - P <sup>2</sup> = 36 - 25 = 11
P2 = 3 → Q2 = 36 - P <sup>2</sup> = 36 - 9 = 27	Q' = - 2P
P1 = 5 / P2 = 3 // Q1 = 11 / Q2 = 27	P = 5 / Q = 11 / Q' = - 2P
$e = \frac{\Delta Q}{\Delta P} * \frac{P1}{Q1} = \frac{+16}{-2} * \frac{5}{11} = \frac{80}{-22} = -3.64$	$e = \frac{dQ}{dP} * \frac{P}{Q} = -2P * \frac{5}{11} = -10 * \frac{5}{11} = -\frac{50}{11} = -4.55$

Remarks:

- In the case of a **non-linear** demand function, the two elasticities lead to **different** results.
- Since the price elasticity of demand is usually negative, the minus sign is often omitted.