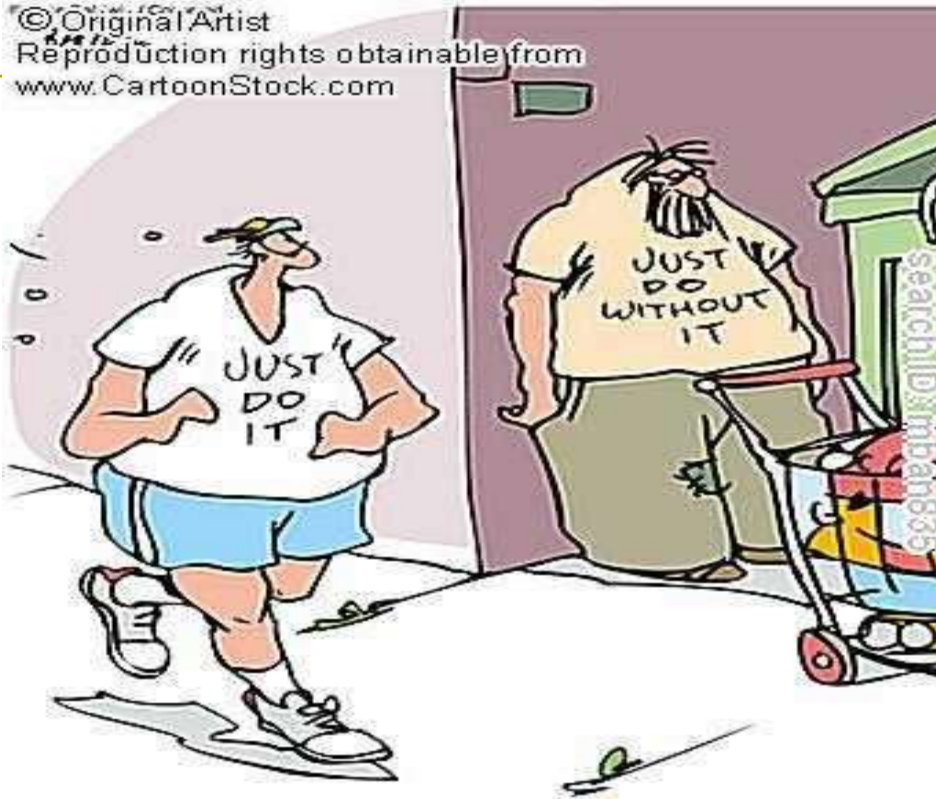


Chapter 20

Elasticity

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How responsive are consumers to a change in price?

- Recall law of demand: As P increases, QD decreases. But how much does QD decrease?
- The answer to this question gives us elasticity of demand.



[Price Elasticity of Demand]

- Definition: measure of how responsive consumers are to a price change.

- Very responsive: elastic



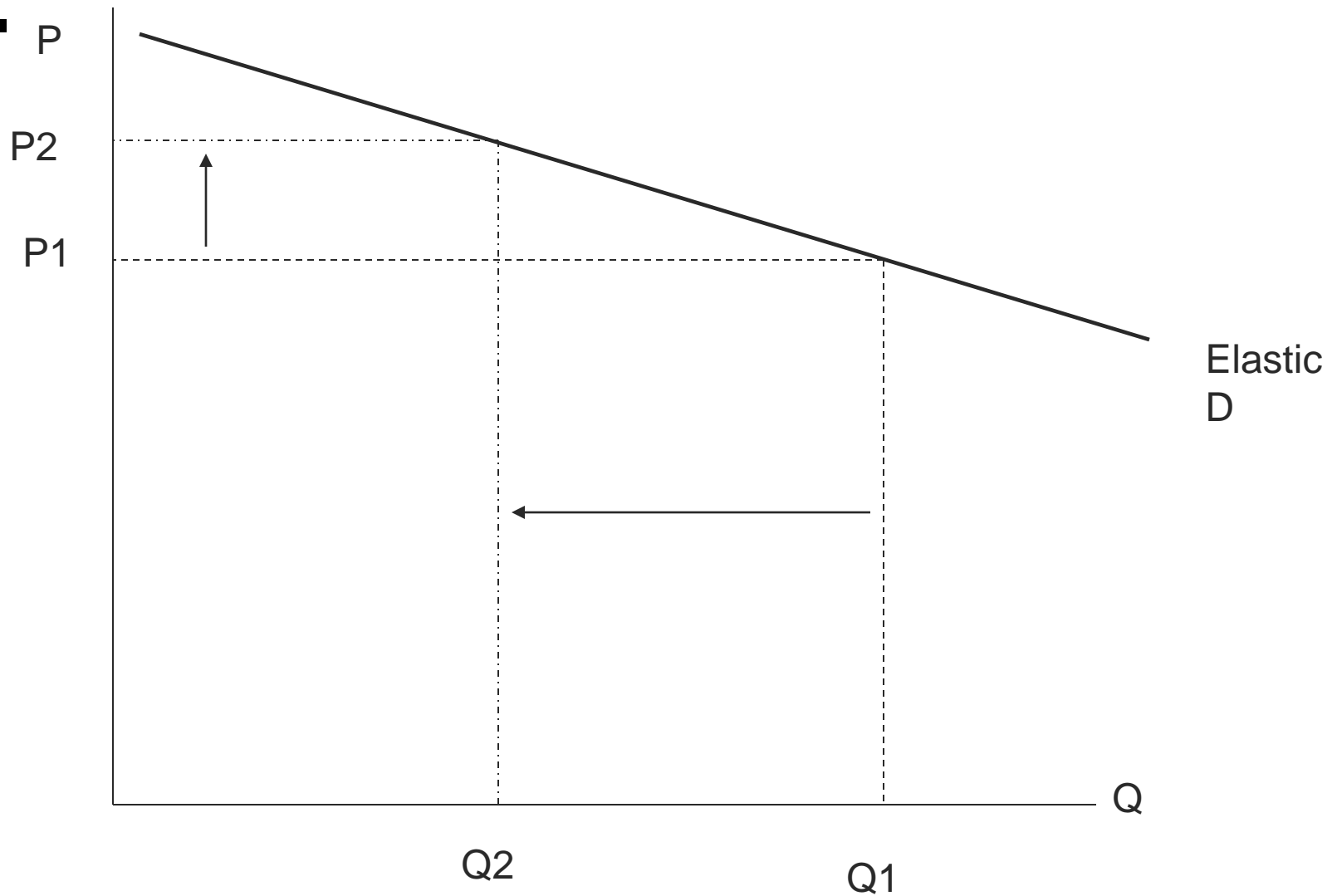
- Not very responsive: inelastic



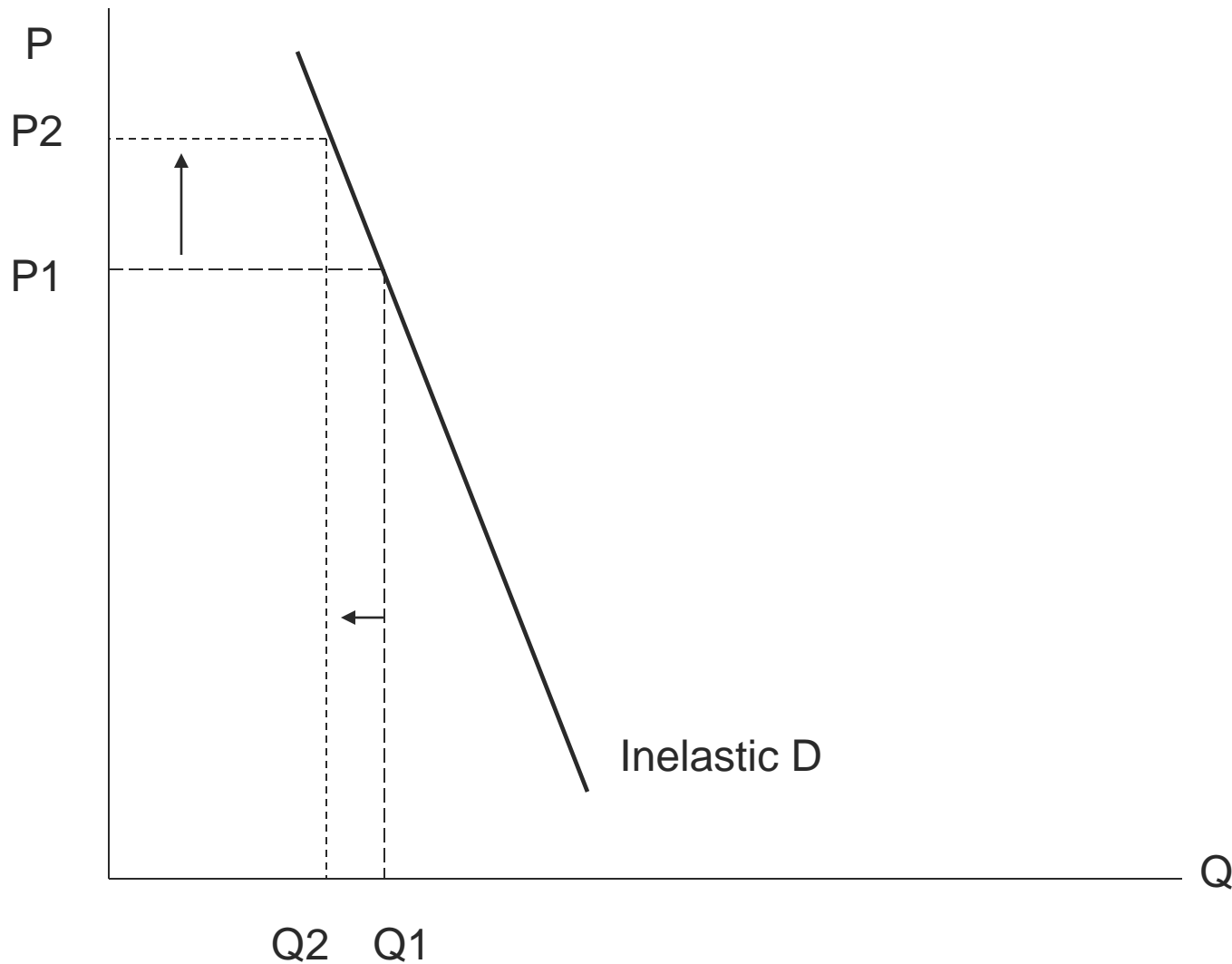
What Determines Elasticity?

- Subs available? subs mean more elastic
- *Proportion of income*: big purchases mean more elastic
- *Luxury vs necessity*: necessity is more inelastic, luxury is more elastic. Addictive substances considered “necessity” in this context.
- *Timeframe*: the sooner you need it, the more inelastic it is.

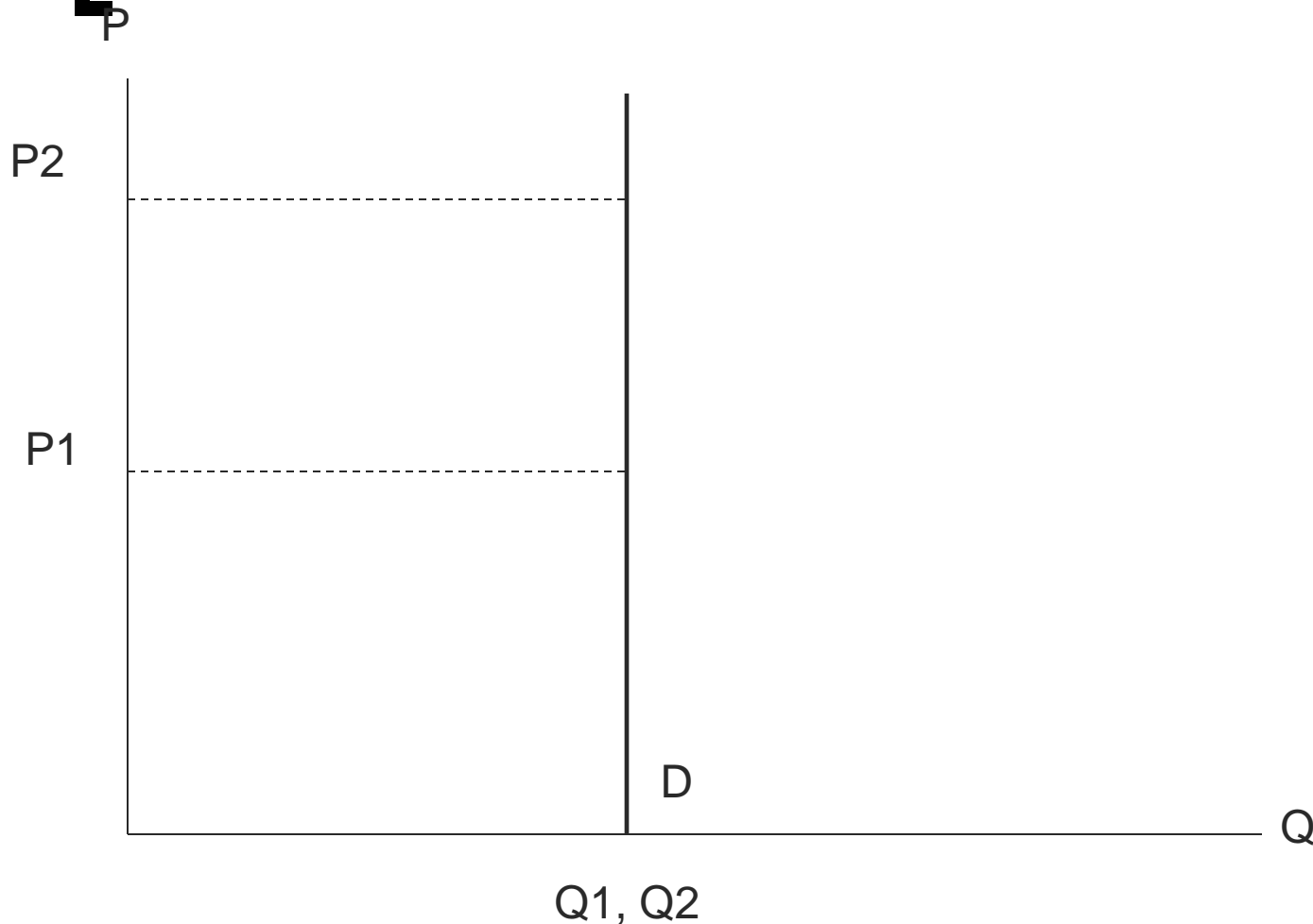
Elastic Demand: A little change in P causes a big change in QD



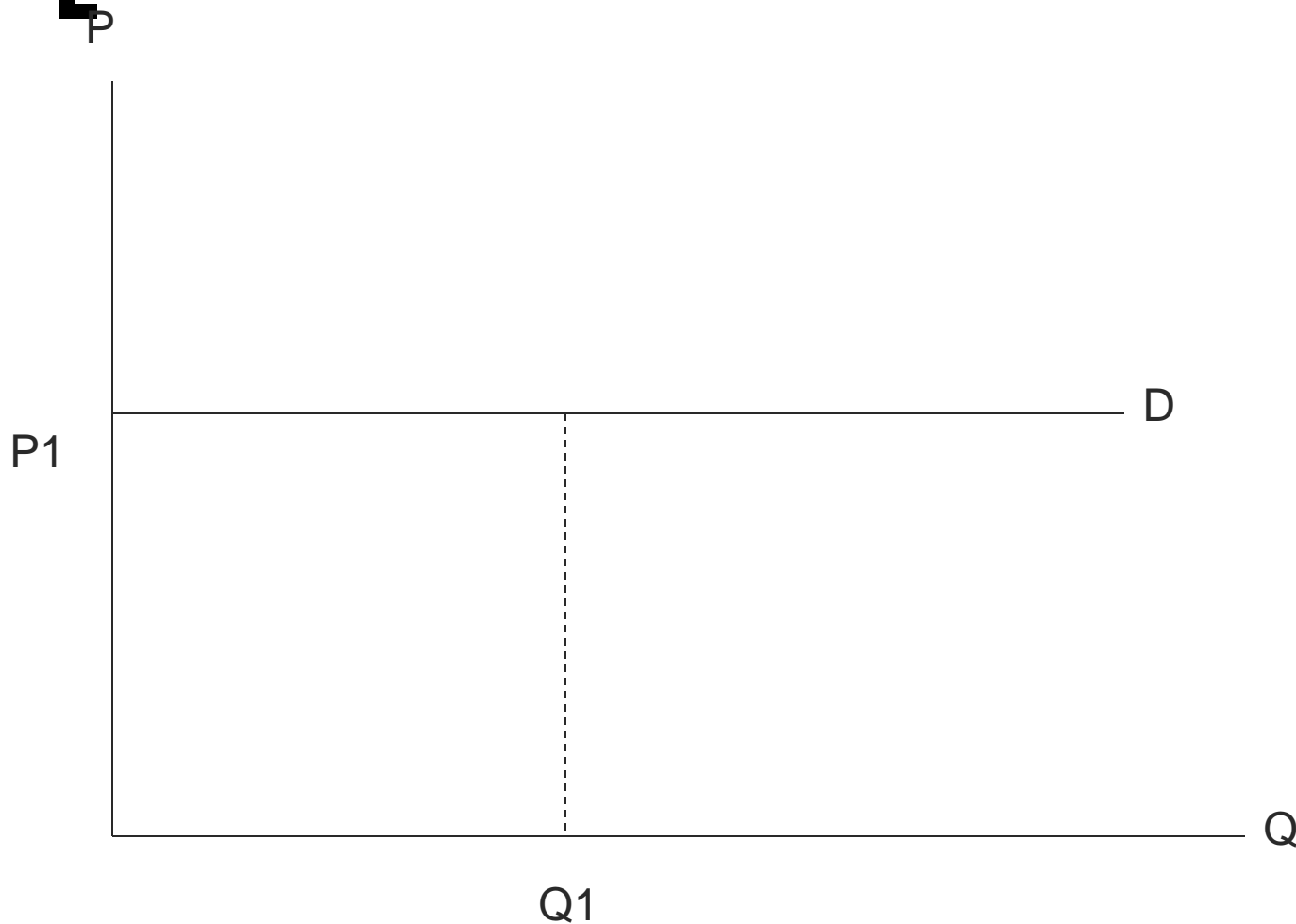
Inelastic Demand: A big change in P causes a little change in QD



Perfectly inelastic demand: Doesn't matter what the price is, QD remains the same



Perfectly elastic demand: any change in P would cause D to be zero



Price Elasticity: Mathematical Definition

- The price elasticity of demand, e_d , is:

$$e_d = \frac{\% \Delta Q^D}{\% \Delta P}$$

- **Example:** If the quantity of movie tickets sold falls by 3% when the price is raised by 1%, then the price elasticity of demand is $3/1 = 3$.

Sign of Price Elasticity

- According to the law of demand, whenever the price rises, the quantity demanded falls. **Thus the price elasticity of demand is always negative.**
- So typically we drop the sign.

Defining elasticities

- When price elasticity is between zero and 1 we say demand is ***inelastic***.
- When price elasticity is between 1 and infinity, we say demand is ***elastic***.
- When price elasticity is 1, we say demand is ***unit elastic***.

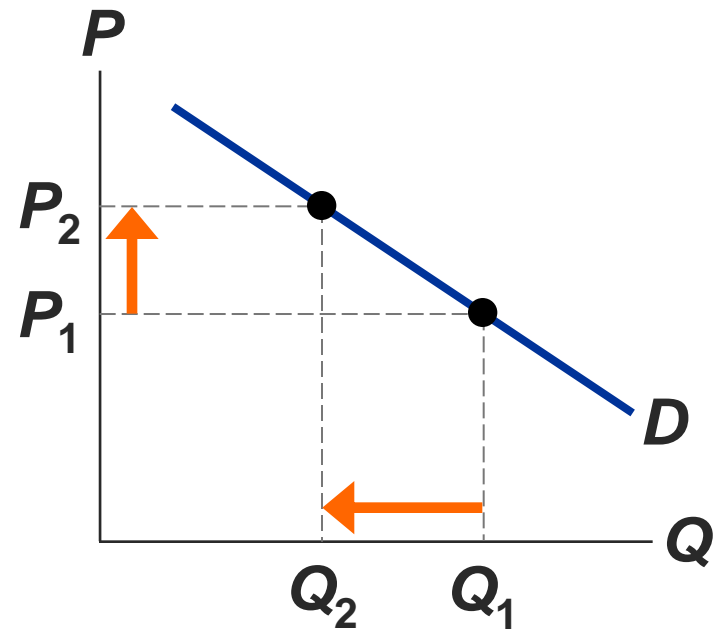
$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q^d}{\text{Percentage change in } P}$$

Example:

Price elasticity of demand equals

$$\frac{15\%}{10\%} = 1.5$$

P rises by 10%




Q falls by 15%

Calculating Percentage Changes

- We use the **midpoint method**:

$$\frac{\text{end value} - \text{start value}}{\text{average}}$$

- 
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- Calculate the price elasticity of demand.
 - The price changes from \$200 to \$250.
 - The quantity demanded changes from 12 to 8 units.

Calculating Percentage Changes

- Using the midpoint method, the % change in P equals

$$\frac{\$250 - \$200}{\$225} = .222 \text{ or } 22.2\%$$

- The % change in Q equals

$$\frac{12 - 8}{10} = .4 \text{ or } 40.0\%$$

- The price elasticity of demand equals

$$40\% / 22.2\% = 1.8$$

which means D is
elastic

ACTIVE LEARNING 1

Calculate an elasticity

Use the following information to calculate the price elasticity of demand for hotel rooms:

if $P = \$70$, $Q^d = 5000$

if $P = \$90$, $Q^d = 3000$



ACTIVE LEARNING 1

Answers

Use midpoint method to calculate
% change in Q^d

$$(5000 - 3000)/4000 = 50\%$$

% change in P

$$(\$90 - \$70)/\$80 = 25\%$$

The price elasticity of demand equals

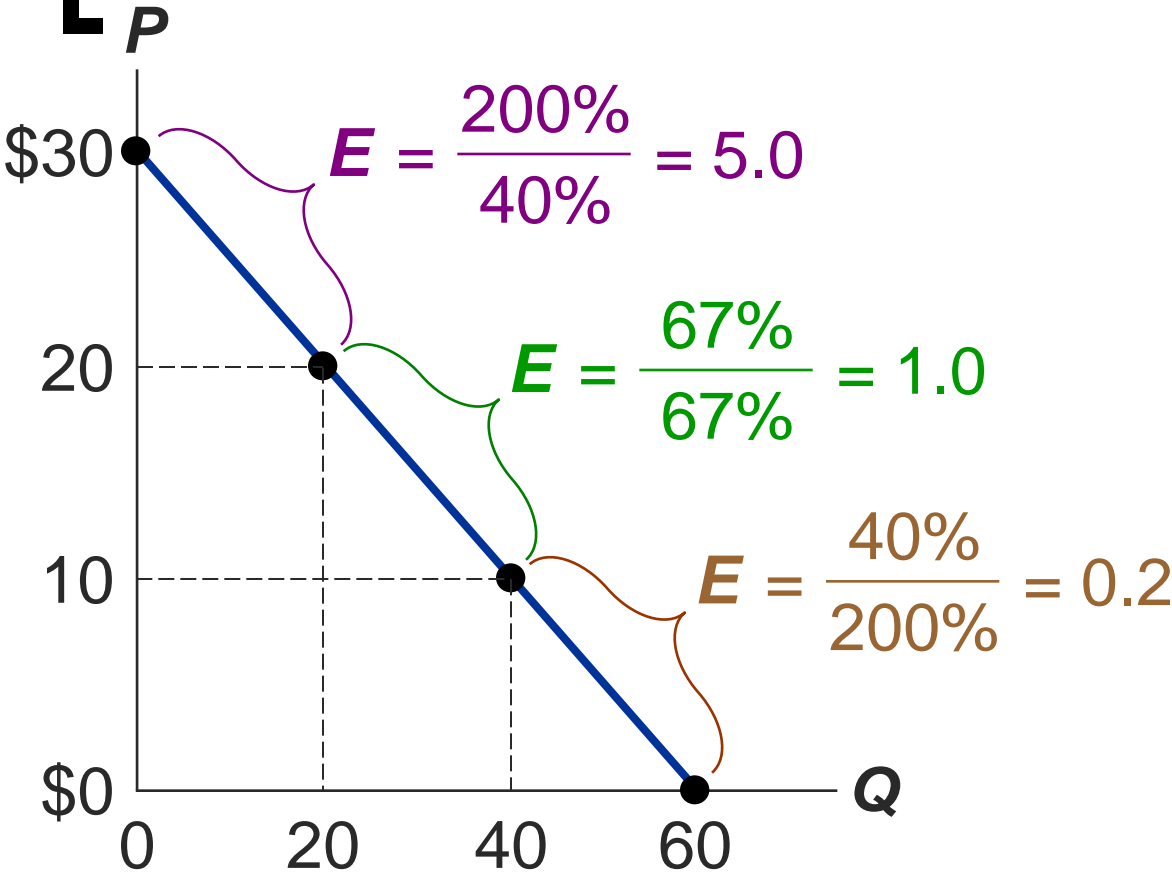
$$\frac{50\%}{25\%} = 2.0$$

Total Revenue and Price Elasticity of Demand

- Total Revenue (TR) equals the price (P) of a product multiplied by the quantity sold (Q):

$$TR = P \times Q$$

Elasticity of a Linear Demand Curve



The slope of a linear demand curve is constant, but its elasticity is not.

Using the Price Elasticity of Demand

- What is the optimal price to maximize total revenue?
- **Answer:** The price at the unit-elastic point. At any higher price, total revenue is decreased.

Other Demand Elasticities

- **Cross-Price Elasticity of Demand:**

% change in QD for A

% change in P for B

- Measures the degree to which goods are **substitutes** or **complements**.
 - If positive, then the goods are substitutes.
 - If negative, then the goods are complements.

The Price Elasticity of Supply

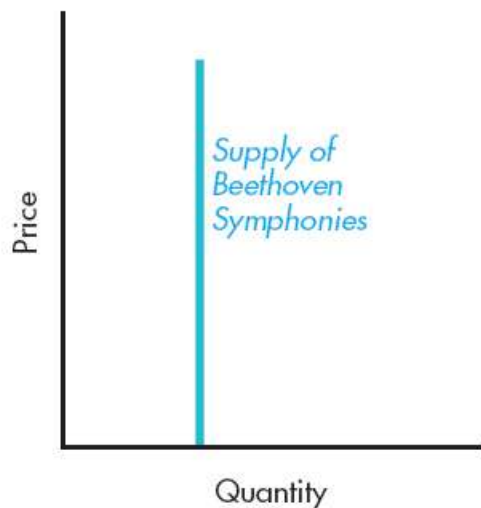
- The price elasticity of supply is the percentage change in the quantity supplied divided by the percentage change in price.

$$e_s = \frac{\% \Delta Q^s}{\% \Delta P}$$

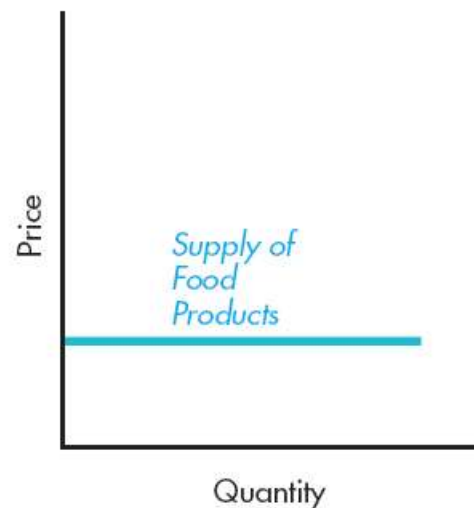
Supply Curve Shapes and Elasticity

FIGURE 3 The Price Elasticity of Supply

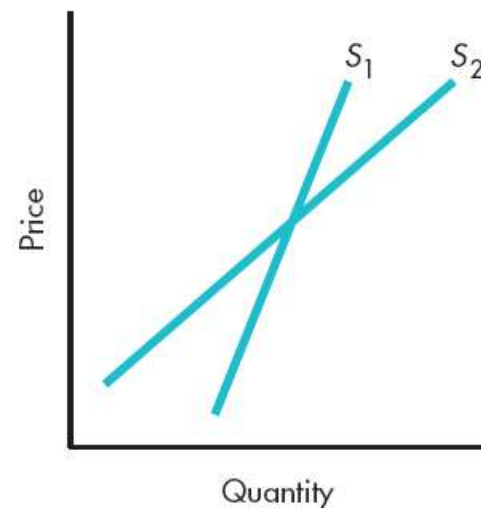
(a) Perfectly Inelastic Supply Curve



(b) Perfectly Elastic Supply Curve




(c) Two Straight-Line Supply Curves



There are some special types of goods for which supply cannot change no matter what the length of time allowed for change. For such goods, the price elasticity of supply is zero and the supply curve is vertical, as shown in Figure 3(a). Figure 3(b) is a perfectly elastic supply curve, a horizontal line. A perfectly elastic supply curve says that the quantity supplied at the given price is unlimited; a small—infinitesimal—price change would lead to an infinite change in quantity supplied. For most goods, the supply curve lies between the perfectly inelastic and perfectly elastic extremes. In Figure 3(c), two supply curves are drawn. Curve S_1 is less elastic than curve S_2 .

Supply Elasticities in the Long and Short Runs

- The shape of the supply curve depends primarily on the length of time being considered.
 - In the **short run**, at least one of the resources used in production cannot be changed.
 - In the **long run**, the firm has long enough to change any aspect of production, and therefore can more fully respond.

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- The more easily sellers can change the quantity they produce, the greater the price elasticity of supply.
 - Example: Supply of beachfront property is harder to vary and thus less elastic than supply of new cars.

Income Elasticity of Demand

- Compares change in income to change in quantity demanded
 - Normal good = buy more with more \$
 - Inferior good = buy more with less \$

$\frac{\% \Delta QD}{\% \Delta Y}$

RULES: positive sign = goods are normal

negative sign = goods are inferior