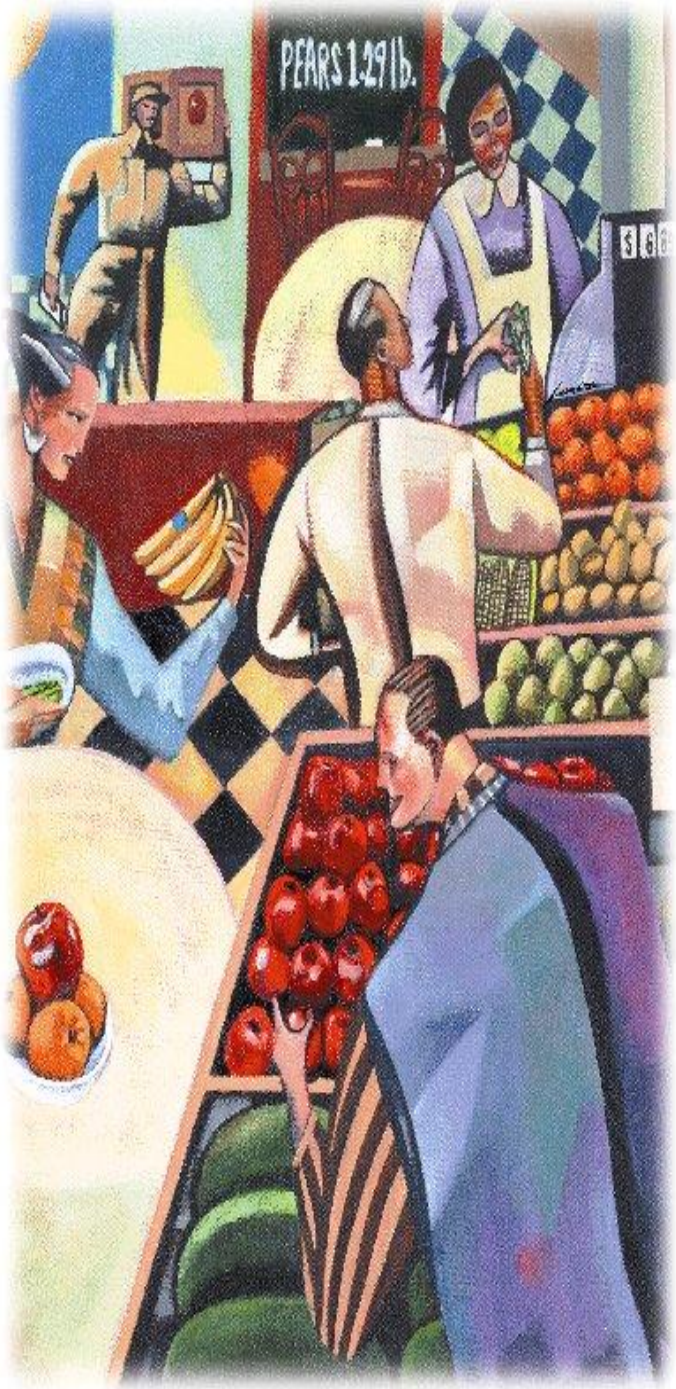


Elasticity and Its Application

Chapter 5

Elasticity . . .

- … is a measure of how much buyers and sellers respond to changes in market conditions

- … allows us to analyze supply and demand with greater precision.

Types of elasticity

- **Price elasticity of Demand/Supply**
- **Income elasticity**
- **Cross price elasticity**

Price Elasticity of Demand

- **Price elasticity of demand** is the percentage change in quantity demanded given a percent change in the price.

- It is a measure of how much the quantity demanded of a good responds to a change in the price of that good.

Determinants of Price Elasticity of Demand

- *Necessities versus Luxuries*
- *Availability of Close Substitutes*
- *Definition of the Market*
- *Time Horizon*

Determinants of Price Elasticity of Demand

Demand tends to be more elastic :

- **if the good is a luxury.**
- **the longer the time period.**
- **the larger the number of close substitutes.**
- **the more narrowly defined the market.**

Computing the Price Elasticity of Demand

The price elasticity of demand is computed as the percentage change in the quantity demanded divided by the percentage change in price.

$$\text{Price Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

Computing the Price Elasticity of Demand

$$\textit{Price elasticity of demand} = \frac{\textit{Percentage change in quatity demanded}}{\textit{Percentage change in price}}$$

Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones then your elasticity of demand would be calculated as:

$$\frac{\frac{(10-8)}{10}\times 100}{\frac{(2.20-2.00)}{2.00}\times 100} = \frac{20 \text{ percent}}{10 \text{ percent}} = 2$$

Computing the Price Elasticity of Demand Using the Midpoint Formula

The **midpoint formula** is preferable when calculating the price elasticity of demand because it gives the same answer regardless of the direction of the change.

$$\text{Price Elasticity of Demand} = \frac{(Q_2 - Q_1)/[(Q_2 + Q_1)/2]}{(P_2 - P_1)/[(P_2 + P_1)/2]}$$

Computing the Price Elasticity of Demand

$$\text{Price Elasticity of Demand} = \frac{(Q_2 - Q_1)/[(Q_2 + Q_1)/2]}{(P_2 - P_1)/[(P_2 + P_1)/2]}$$

Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones the your elasticity of demand, using the midpoint formula, would be calculated as:

$$\frac{\dfrac{(10-8)}{(10+8)/2}}{\dfrac{(2.20-2.00)}{(2.00+2.20)/2}} = \frac{22\ percent}{9.5\ percent} = 2.32$$

Ranges of Elasticity

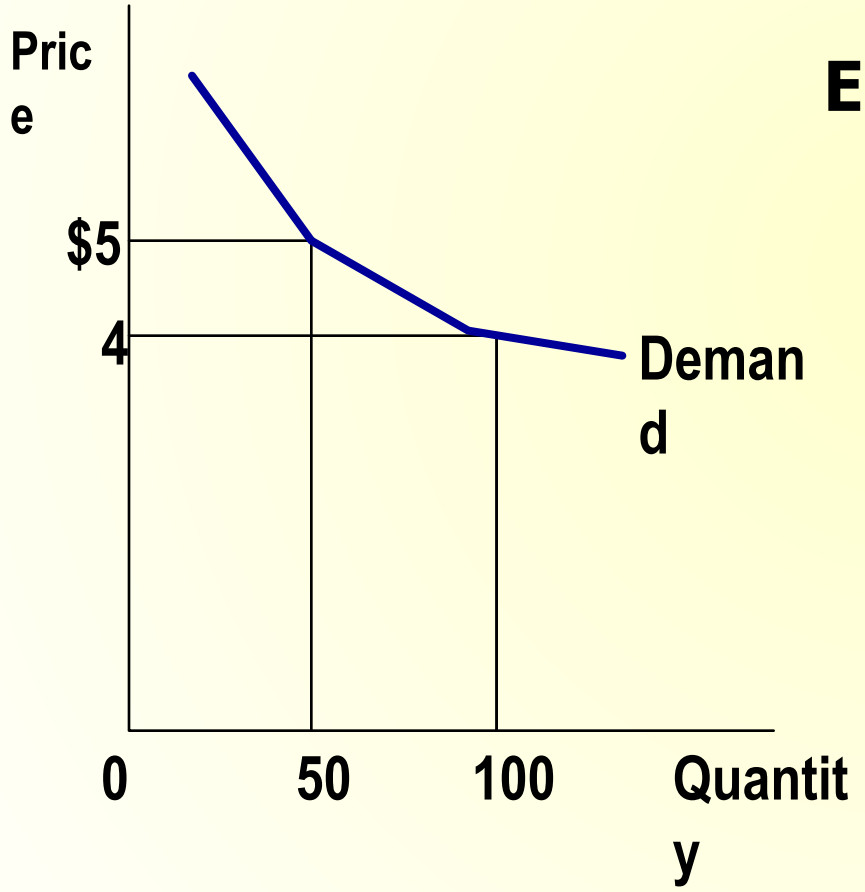
Inelastic Demand

- **Quantity demanded *does not respond* strongly to price changes.**
- **Price elasticity of demand is *less than* one.**

Elastic Demand

- **Quantity demanded *responds strongly* to changes in price.**
- **Price elasticity of demand is *greater than* one.**

Computing the Price Elasticity of Demand



$$E_D = \frac{(100-50)/(100+50)/2}{(4.00-5.00)/(4.00+5.00)/2}$$

$$= \frac{67 \text{ percent}}{-22 \text{ percent}} = -3$$

Demand is price elastic

Ranges of Elasticity

- ***Perfectly Inelastic***

Quantity demanded does not respond to price changes.

- ***Perfectly Elastic***

Quantity demanded changes infinitely with any change in price.

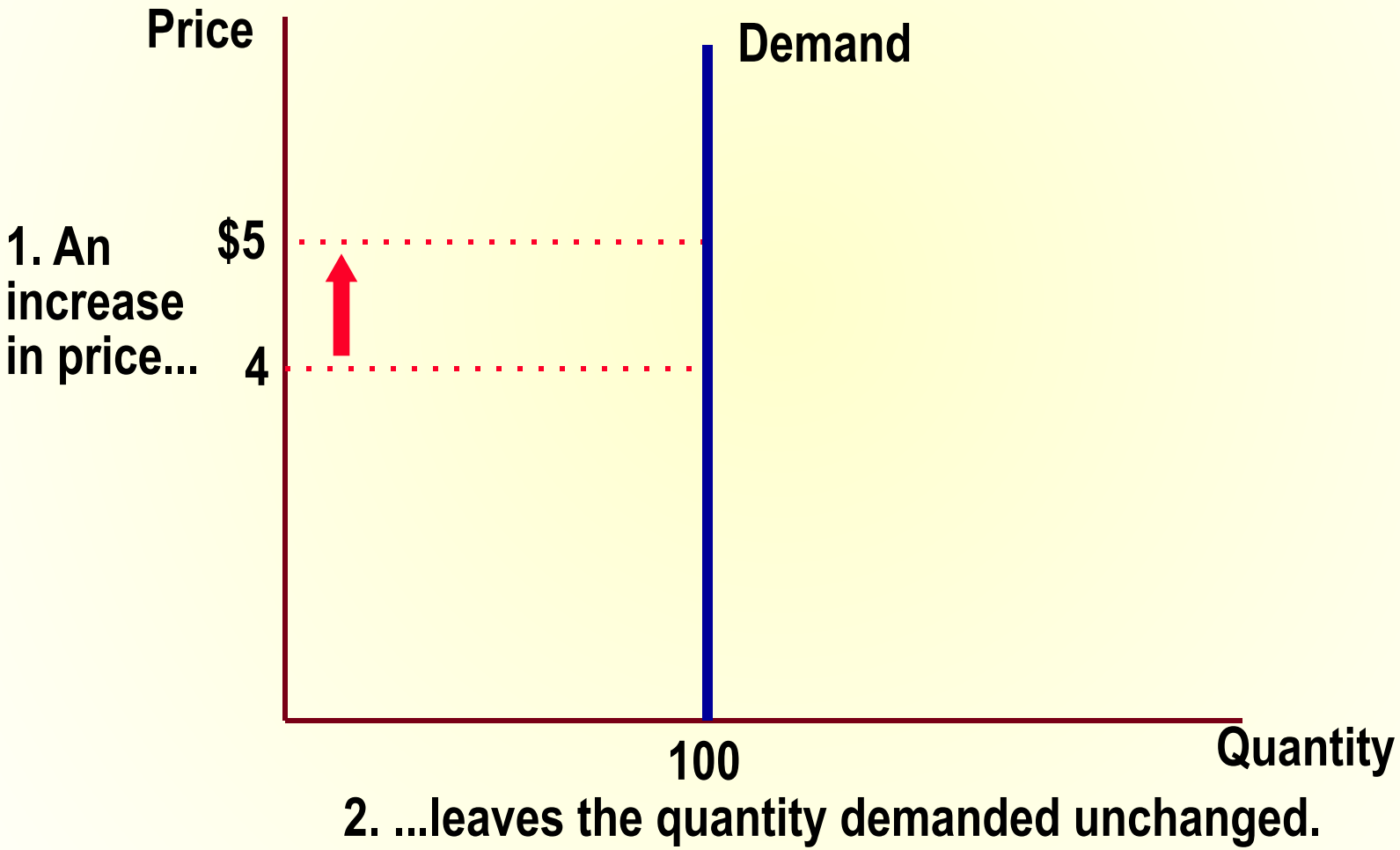
- ***Unit Elastic***

Quantity demanded changes by the same percentage as the price.

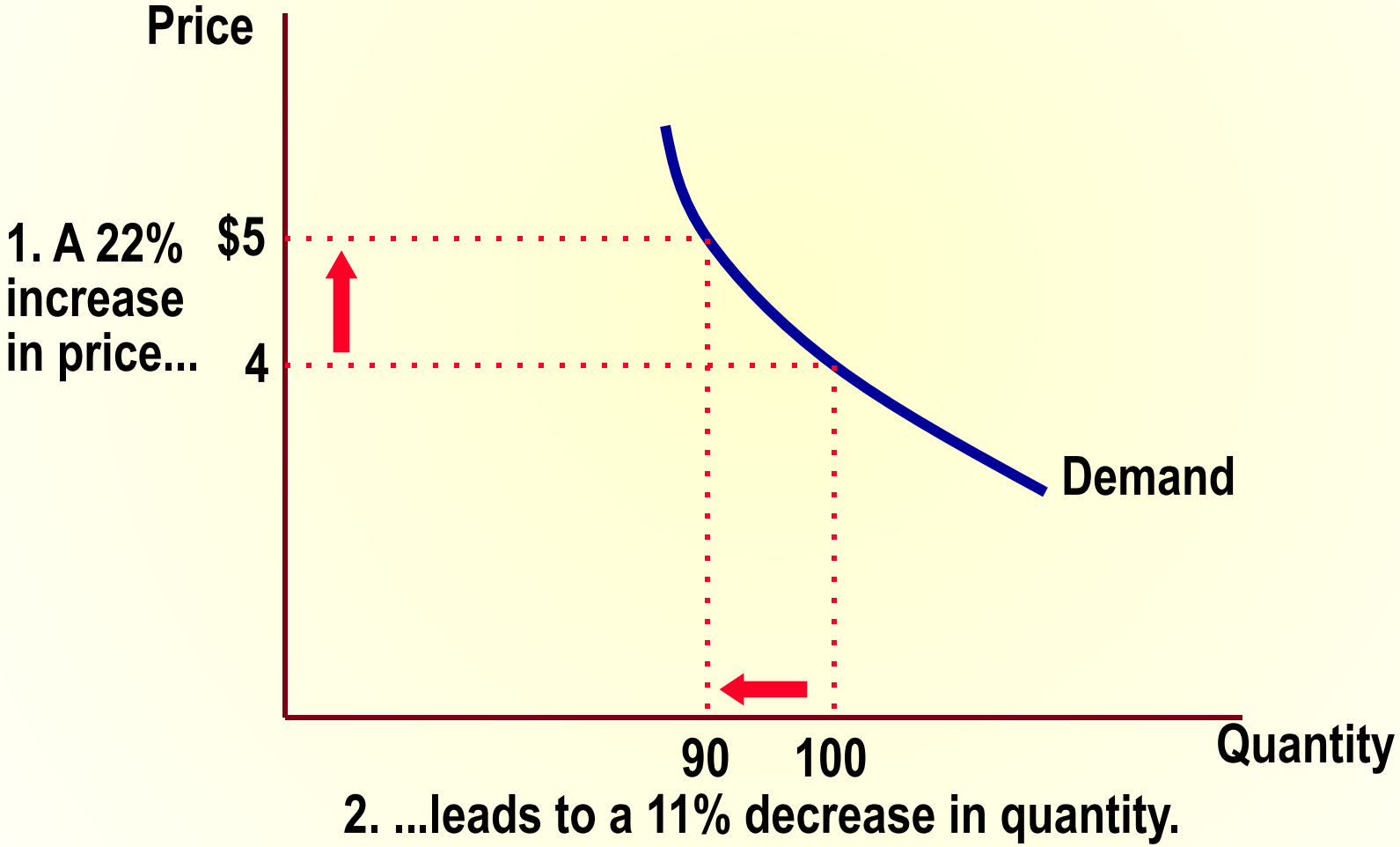
A Variety of Demand Curves

Because the price elasticity of demand measures how much quantity demanded responds to the price, it is closely related to the slope of the demand curve.

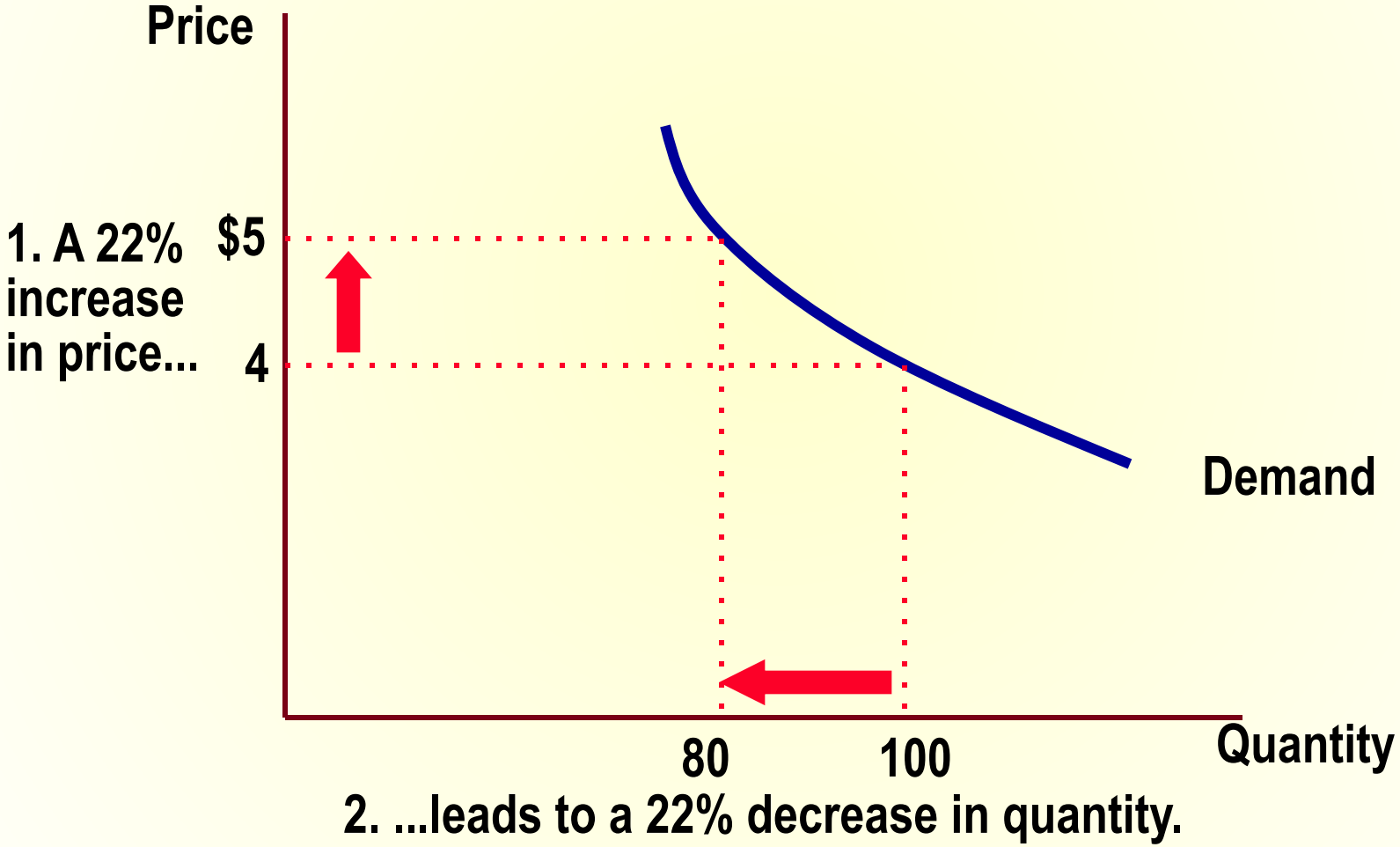
Perfectly Inelastic Demand
- Elasticity equals 0



Inelastic Demand
- Elasticity is less than 1

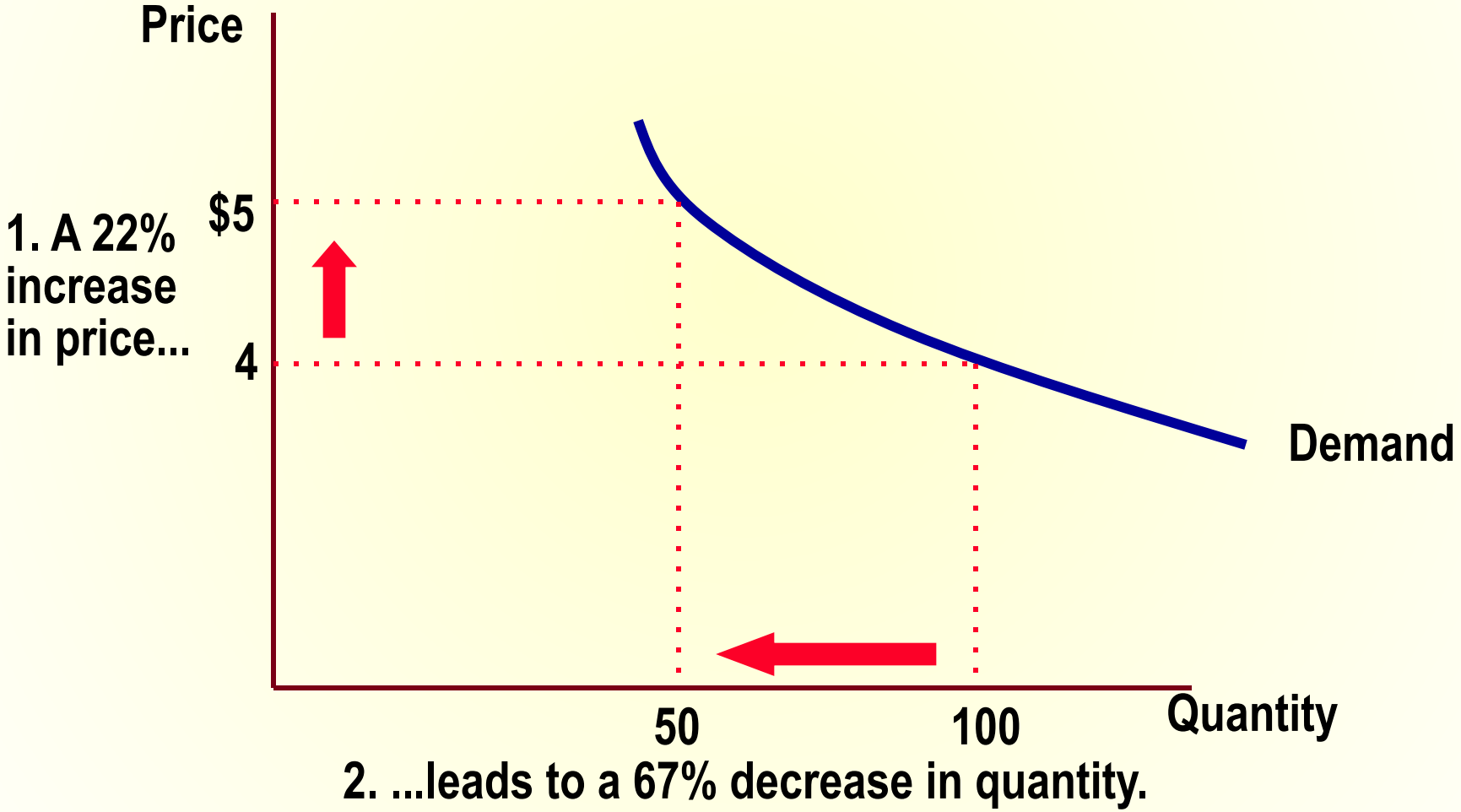


Unit Elastic Demand
- Elasticity equals 1



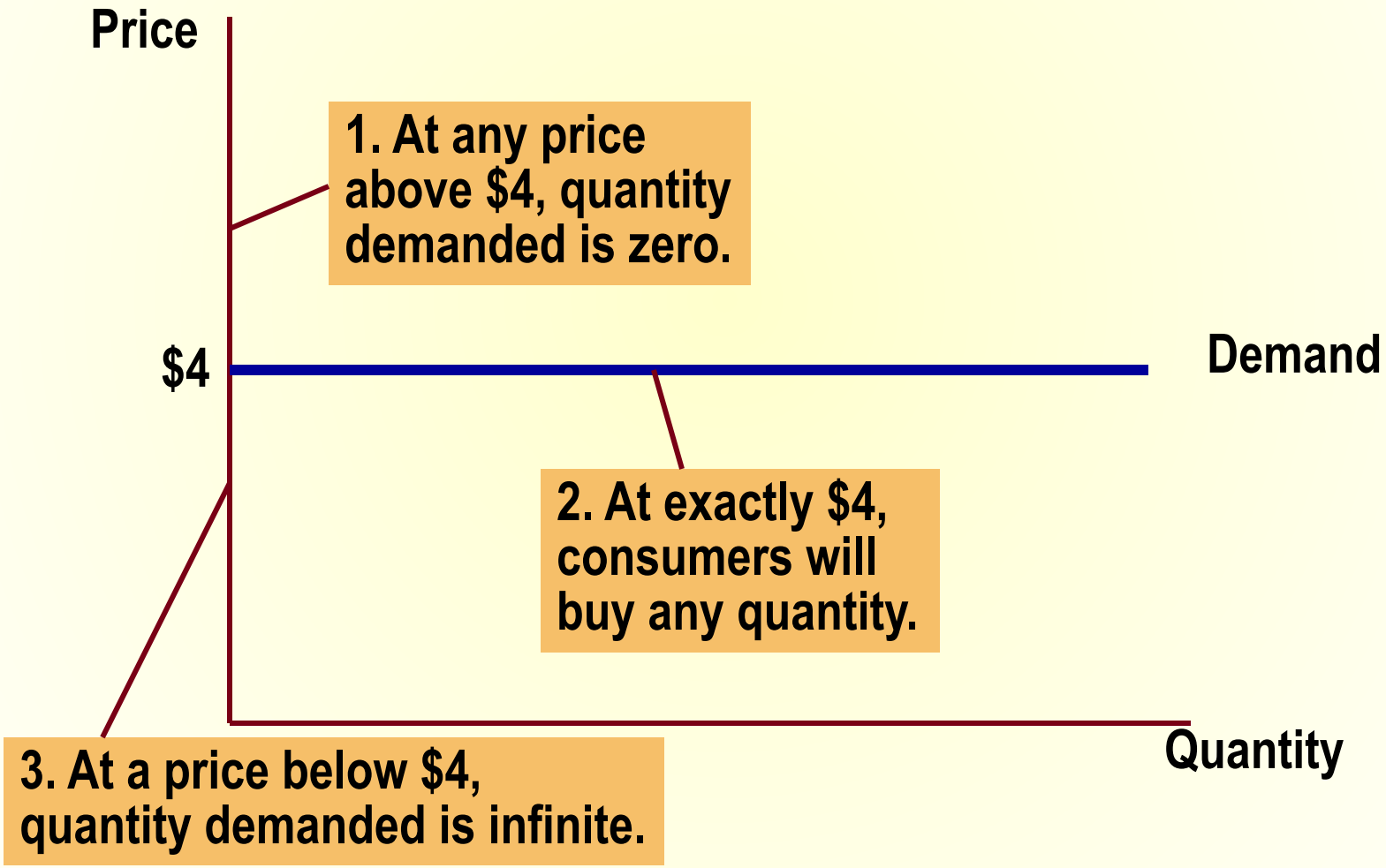
Elastic Demand

- Elasticity is greater than 1



Perfectly Elastic Demand

- Elasticity equals infinity

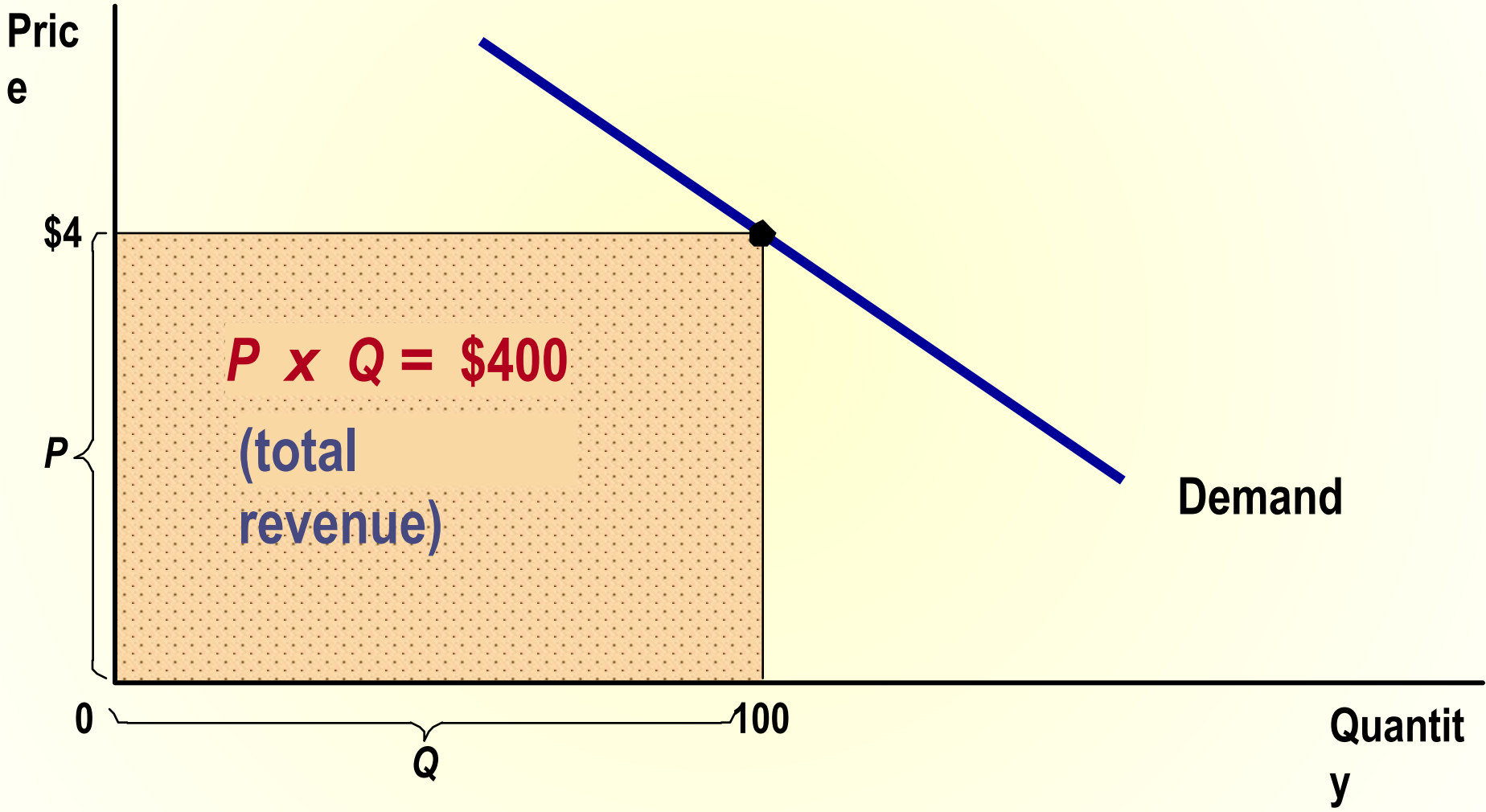


Elasticity and Total Revenue

- **Total revenue** is the amount paid by buyers and received by sellers of a good.
- Computed as the price of the good times the quantity sold.

$$TR = P \times Q$$

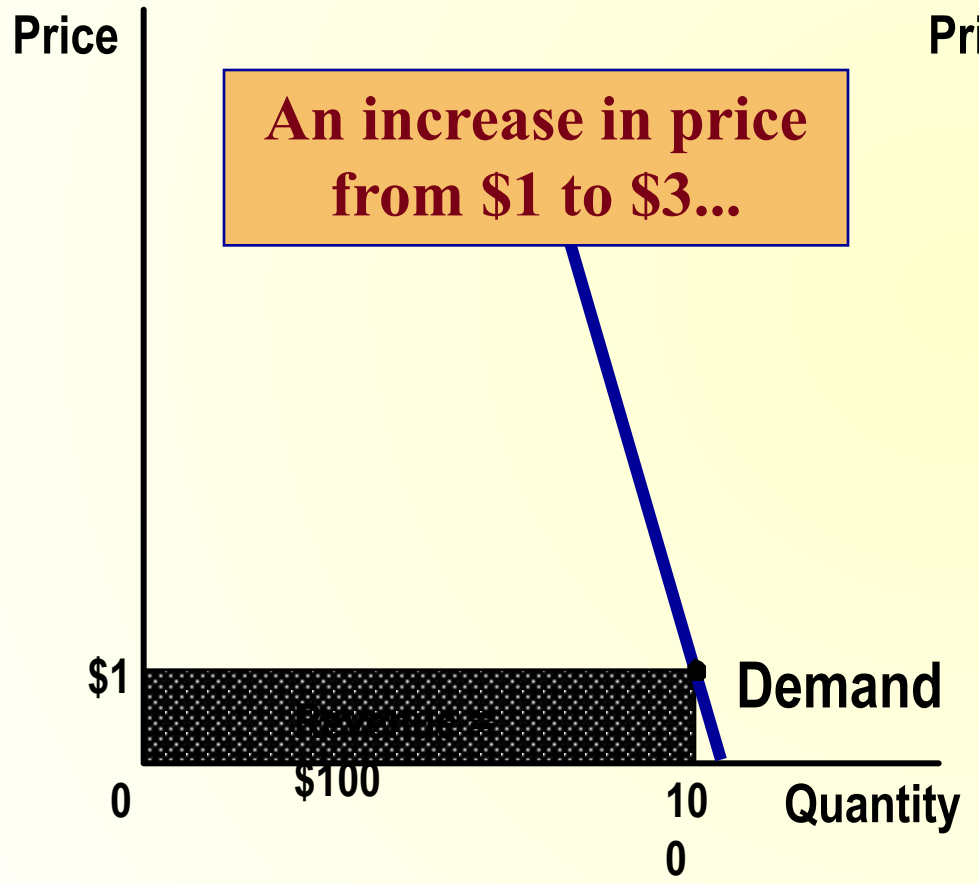
Elasticity and Total Revenue

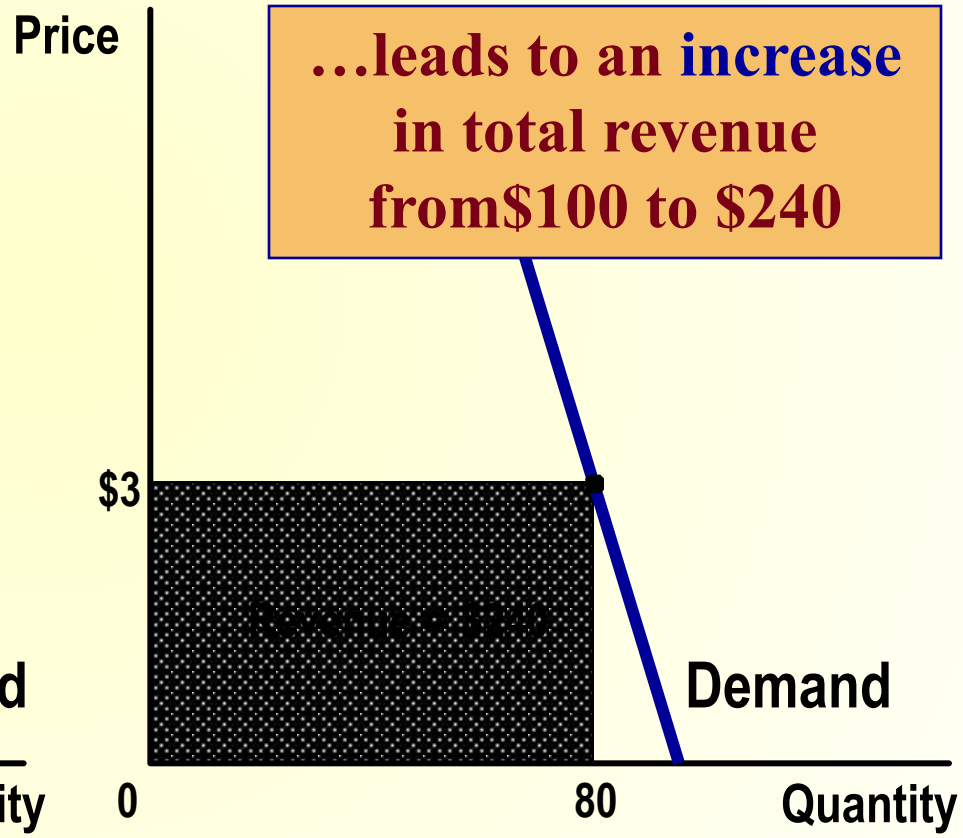


Elasticity and Total Revenue

With an inelastic demand curve, an increase in price leads to a decrease in quantity that is proportionately smaller. Thus, total revenue increases.

Elasticity and Total Revenue: Inelastic Demand

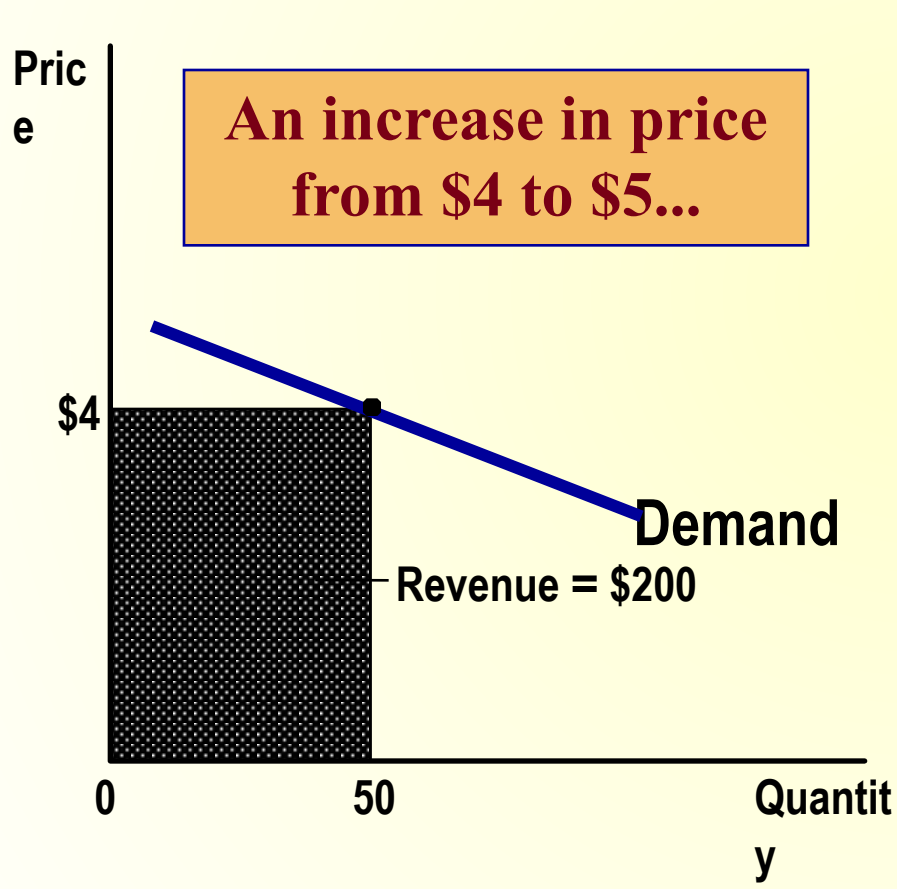


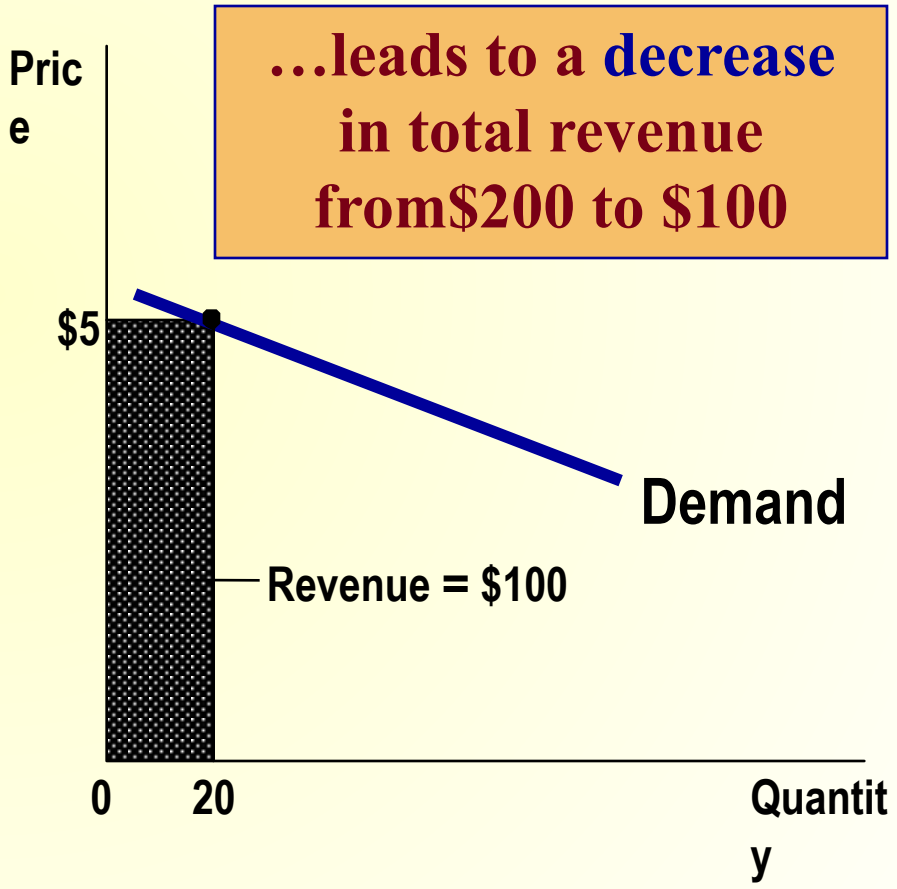


Elasticity and Total Revenue

With an elastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately larger. Thus, total revenue decreases.

Elasticity and Total Revenue: Elastic Demand



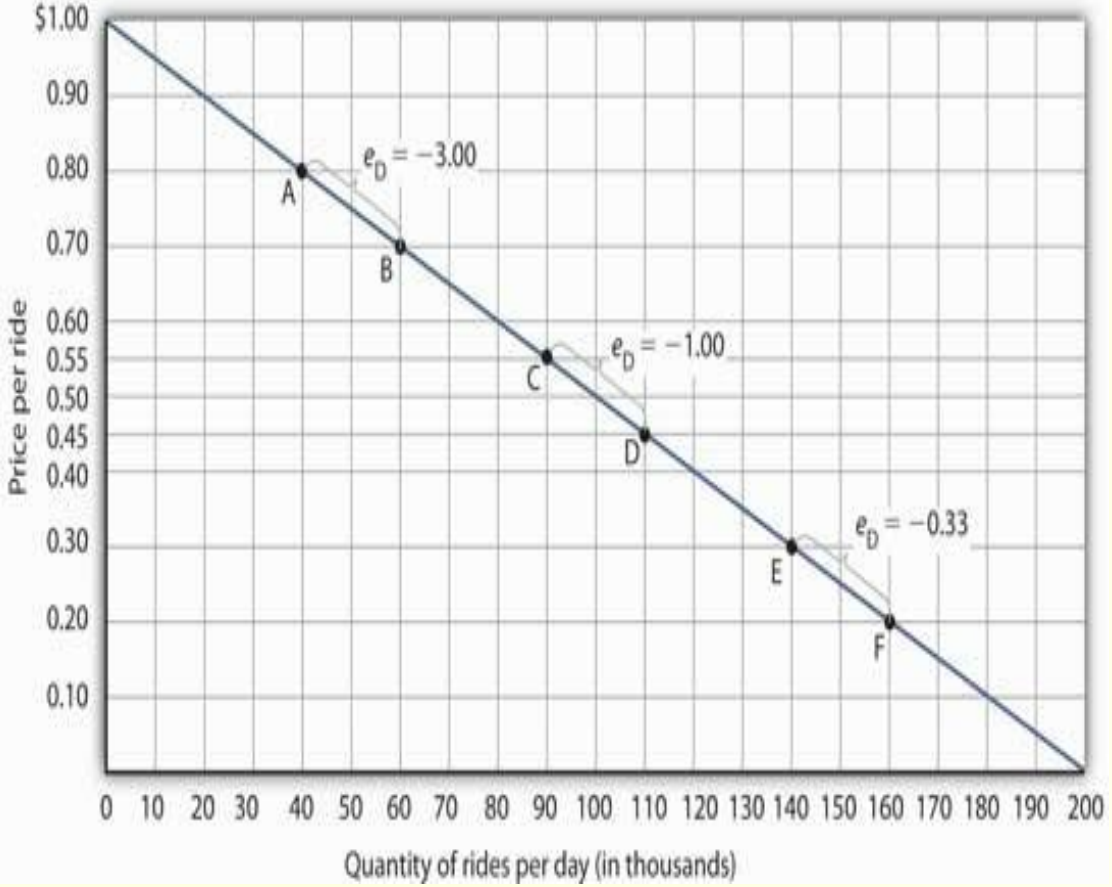


Elasticity on a Linear Demand Curve

$$e_D = \frac{\frac{20{,}000}{(40{,}000+60{,}000)/2}}{\frac{-0.10}{(0.70+0.80)/2}} = -3.00$$

$$e_D = \frac{\frac{20{,}000}{(90{,}000+110{,}000)/2}}{\frac{-0.10}{(0.55+0.45)/2}} = -1.00$$

$$e_D = \frac{\frac{20{,}000}{(140{,}000+160{,}000)/2}}{\frac{-0.10}{(0.30+0.20)/2}} = -0.33$$



Computing the Elasticity of a Linear Demand Curve

Price	Quantity	Total Revenue (Price x Quantity)	Percent Change in Price	Percent Change in Quantity	Elasticity	Description
$0	14	$0	200%	15%	0.1	Inelastic
1	12	12	67	18	0.3	Inelastic
2	10	20	40	22	0.6	Inelastic
3	8	24	29	29	1	Unit elastic
4	6	24	22	40	1.8	elastic
5	4	20	18	67	3.7	elastic
6	2	12	15	200	13	elastic
7	0	0				

Income Elasticity of Demand

- **Income elasticity of demand measures how much the quantity demanded of a good responds to a change in consumers' income.**
- **It is computed as the percentage change in the quantity demanded divided by the percentage change in income.**

Computing Income Elasticity

$$\text{Income Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Income}}$$

Income Elasticity
- Types of Goods -

- ***Normal Goods***
- ***Inferior Goods***
- **Higher income *raises* the quantity demanded for normal goods but *lowers* the quantity demanded for inferior goods.**

Income Elasticity
- Types of Goods -

- **Goods consumers regard as necessities tend to be *income inelastic***
  Examples include food, fuel, clothing, utilities, and medical services.
- **Goods consumers regard as luxuries tend to be *income elastic*.**
  Examples include sports cars, furs, and expensive foods.

Cross-Price Elasticity of Demand

- **It measures how the quantity demanded of one good responds to a change in the price of another good.**
- **It is calculated as the percentage change in quantity demanded of good1 divided by the percentage change in the price of good 2.**
- **For substitutes it is positive; for complements it is negative.**

Price Elasticity of Supply

- **Price elasticity of supply** is the percentage change in quantity supplied resulting from a percent change in price.
- It is a measure of how much the quantity supplied of a good responds to a change in the price of that good.

Ranges of Elasticity

- **Perfectly Elastic**

$$E_s = \infty$$

- **Relatively Elastic**

$$E_s > 1$$

- **Unit Elastic**

$$E_s = 1$$

Ranges of Elasticity

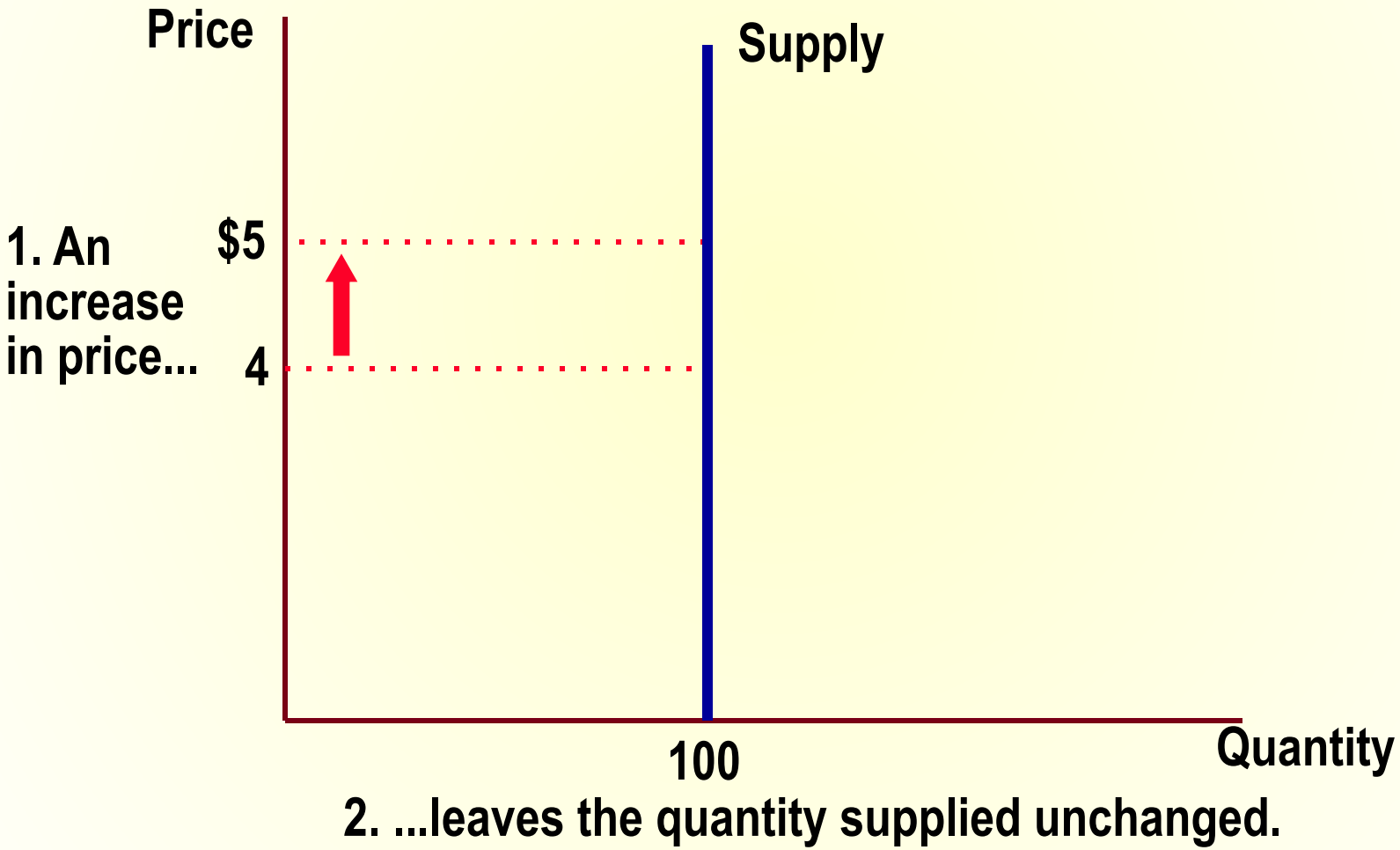
- **Relatively Inelastic**

$$E_s < 1$$

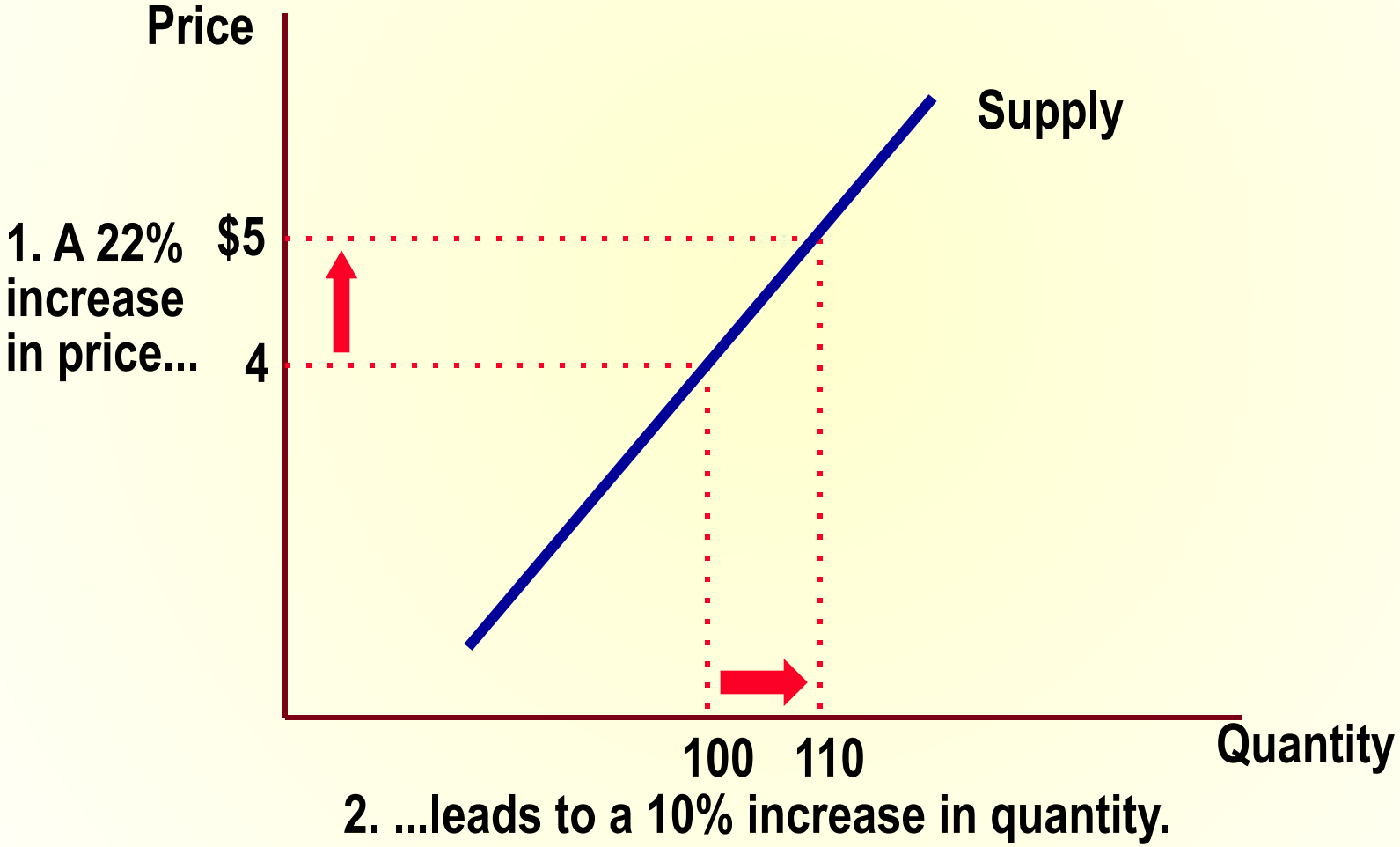
- **Perfectly Inelastic**

$$E_s = 0$$

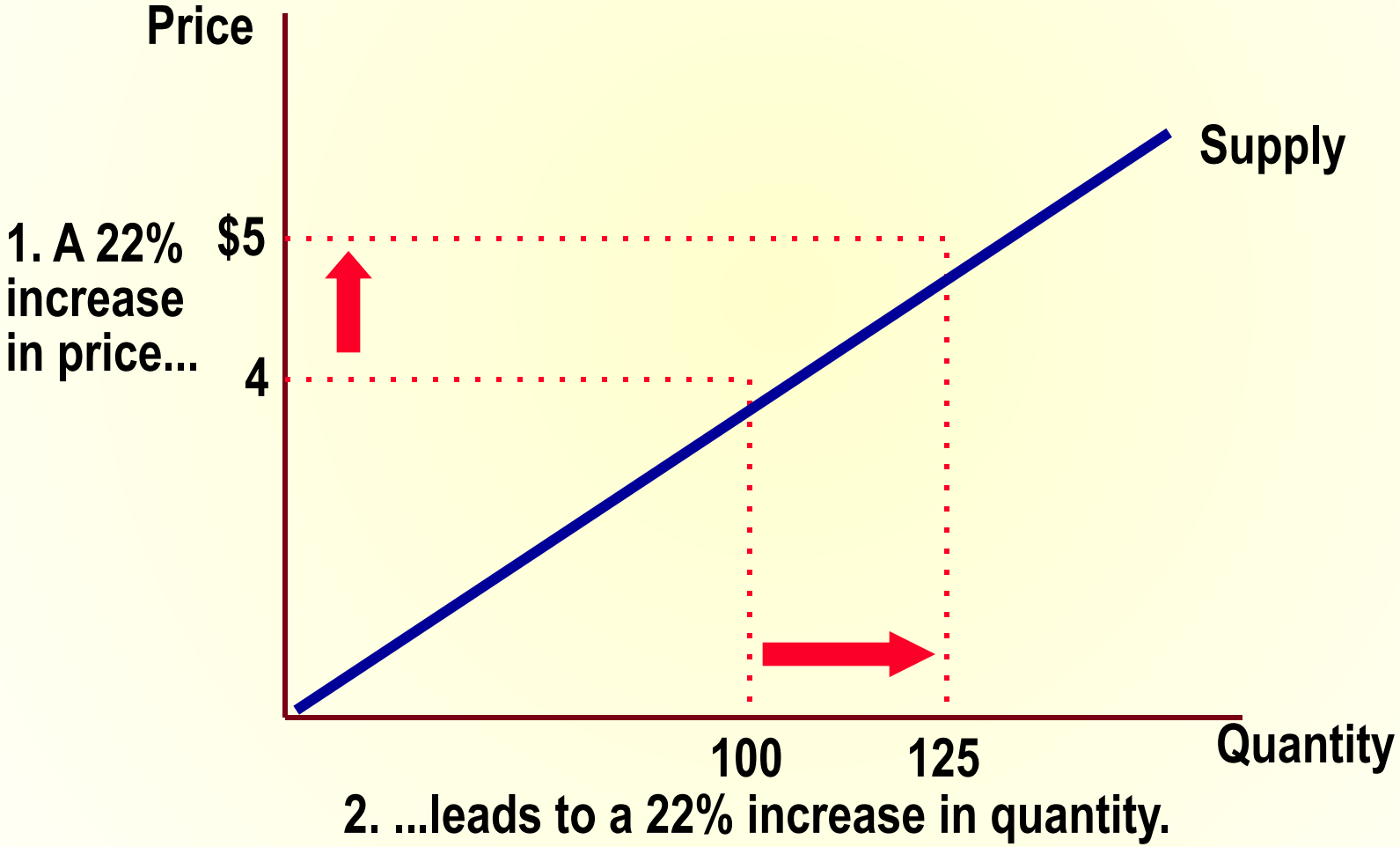
Perfectly Inelastic Supply
- Elasticity equals 0



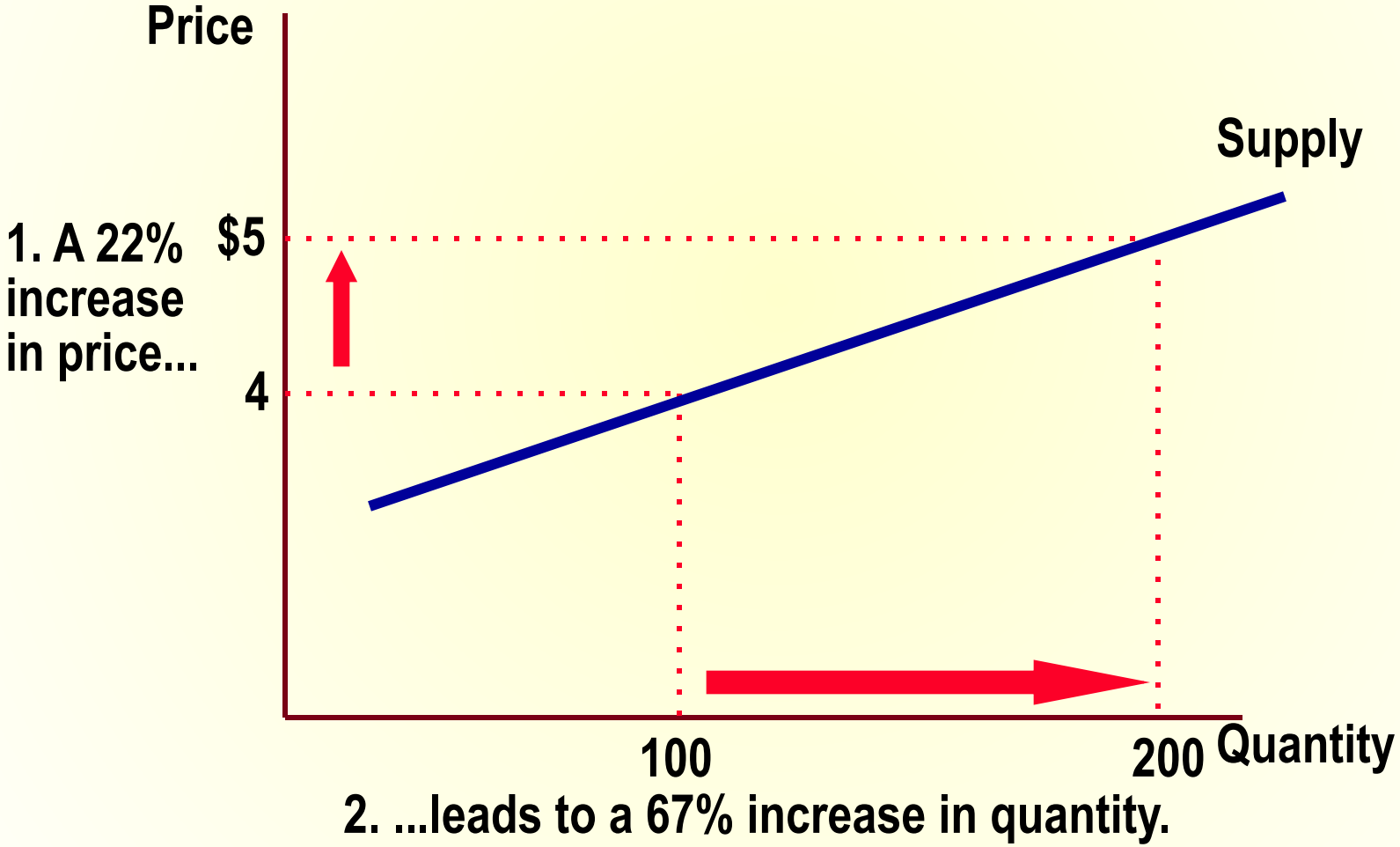
Inelastic Supply
- Elasticity is less than 1



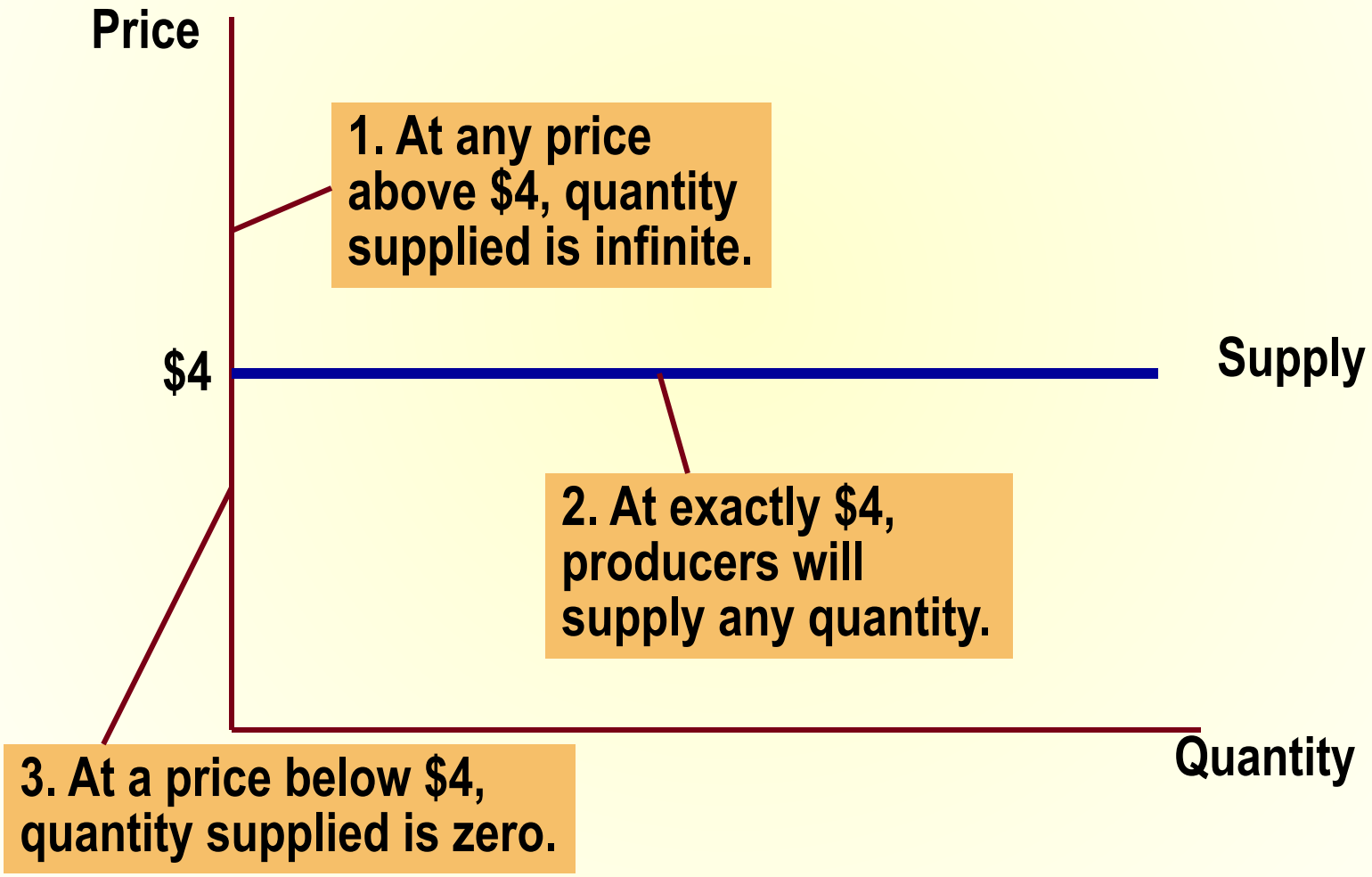
Unit Elastic Supply
- Elasticity equals 1



Elastic Supply
- Elasticity is greater than 1



Perfectly Elastic Supply
- Elasticity equals infinity



Determinants of Elasticity of Supply

- Ability of sellers to change the amount of the good they produce.
  - Beach-front land is inelastic.
  - Books, cars, or manufactured goods are elastic.
- Time period.
  - Supply is more elastic in the long run.

Computing the Price Elasticity of Supply

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

$$\text{Elasticity of Supply} = \frac{\text{Percentage Change in Quantity Supplied}}{\text{Percentage Change in Price}}$$

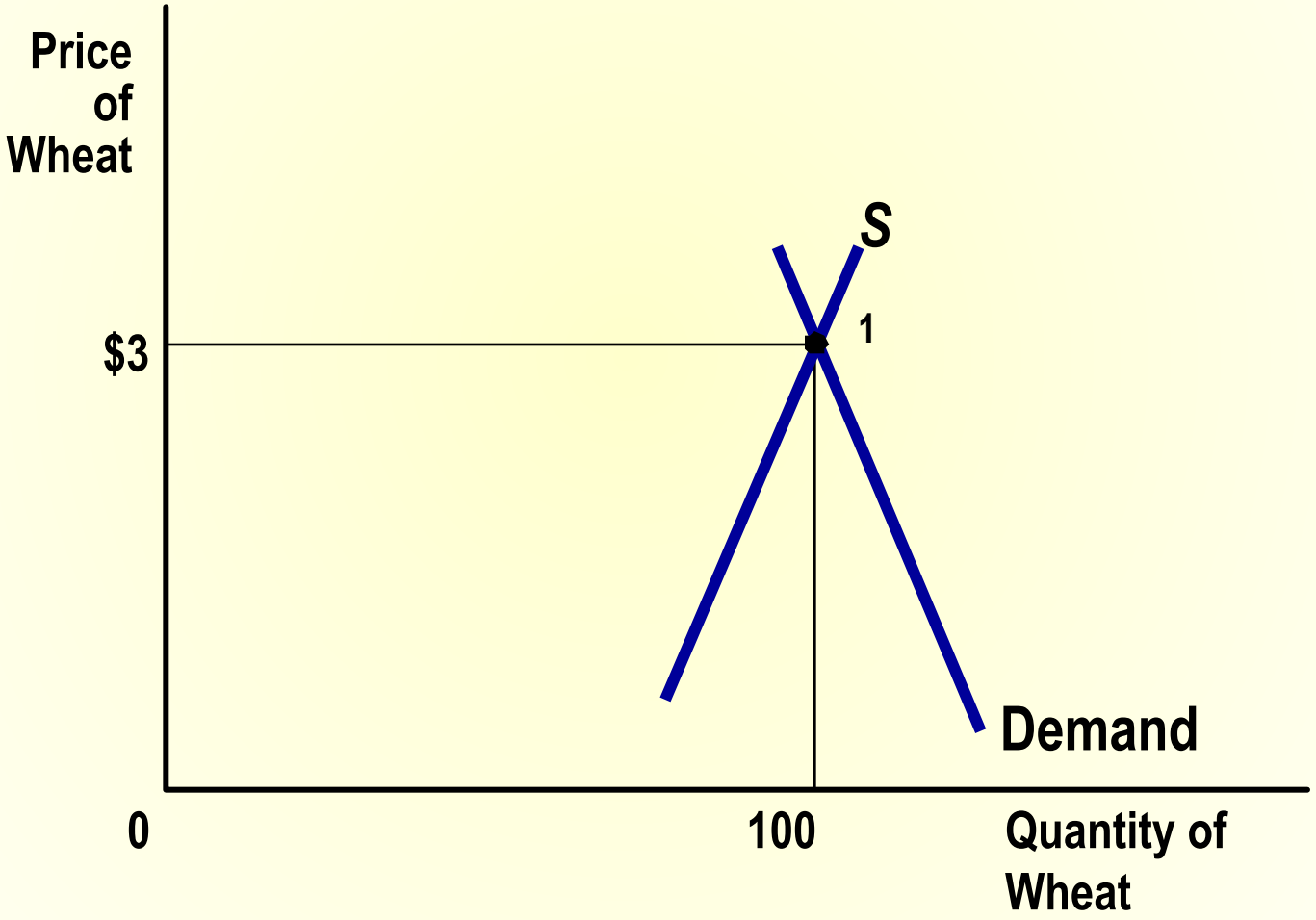
Application of Elasticity

- Can good news for farming be bad news for farmers?
- What happens to wheat farmers and the market for wheat when university agronomists discover a new wheat hybridthat is more productive than existing varieties?

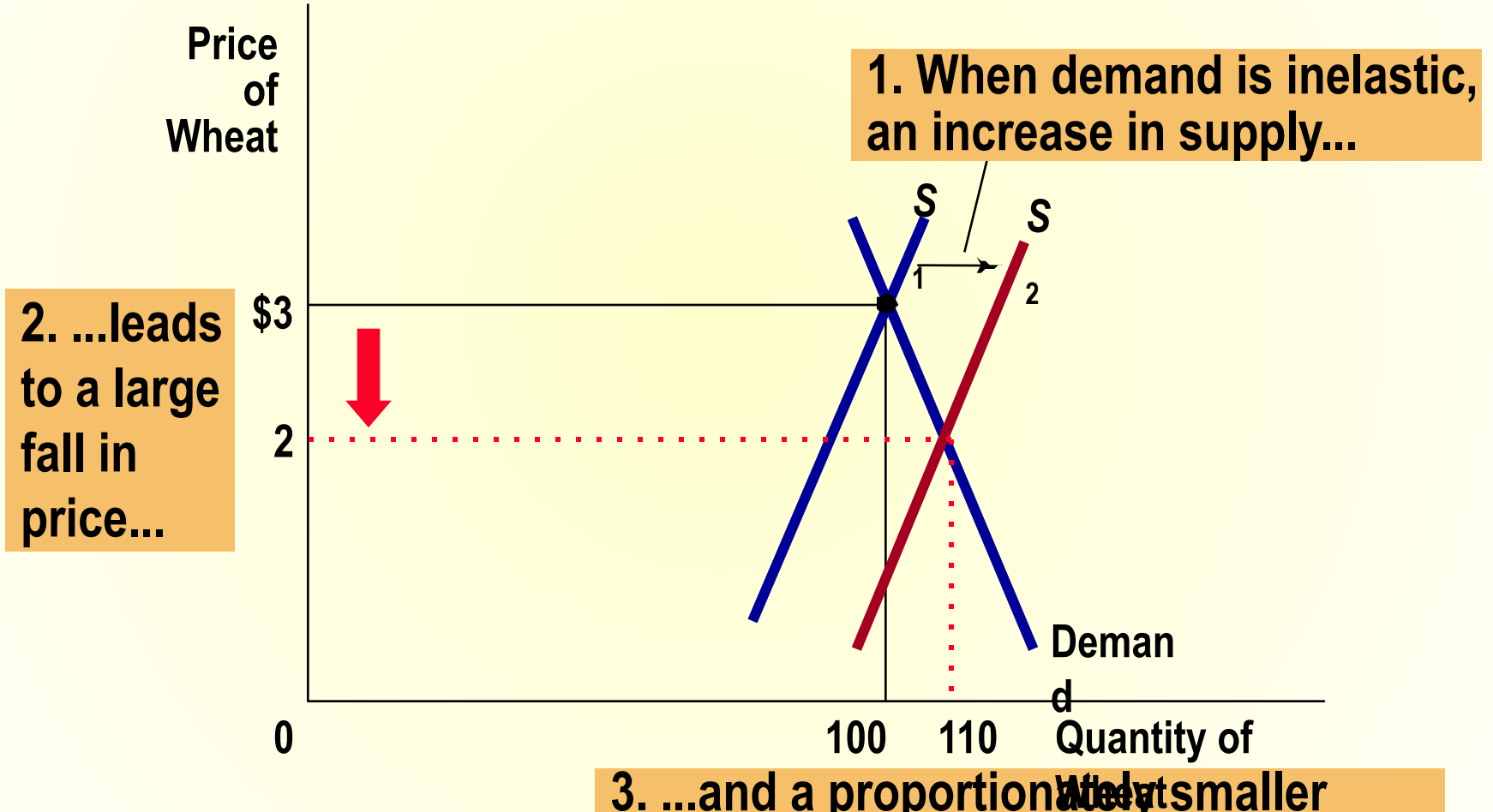
Application of Elasticity

- Examine whether the supply or demand curve shifts.
- Determine the direction of the shift of the curve.
- Use the supply-and-demand diagram to see how the market equilibrium changes.

An Increase in Supply in the Market for Wheat



An Increase in Supply in the Market for Wheat



Compute Elasticity

$$E_D = \frac{100 - 110 \,/\, (100 + 110)/2}{3.00 - 2.00 \,/\, (3.00 + 2.00)/2}$$

$$= \frac{-0.095}{0.4} \approx -0.24$$

Compute Elasticity

$$E_D = \frac{100 - 110 \,/\, (100 + 110)/2}{3.00 - 2.00 \,/\, (3.00 + 2.00)/2}$$

$$= \frac{-0.095}{0.4} \approx -0.24$$

Demand is inelastic

Summary

- Price elasticity of demand measures how much the quantity demanded responds to changes in the price.
- If a demand curve is elastic, total revenue falls when the price rises.
- If it is inelastic, total revenue rises as the price rises.