

# Elasticity and Its Application

## Chapter 5

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# 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.**

# 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

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

**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:

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

# Ranges of Elasticity

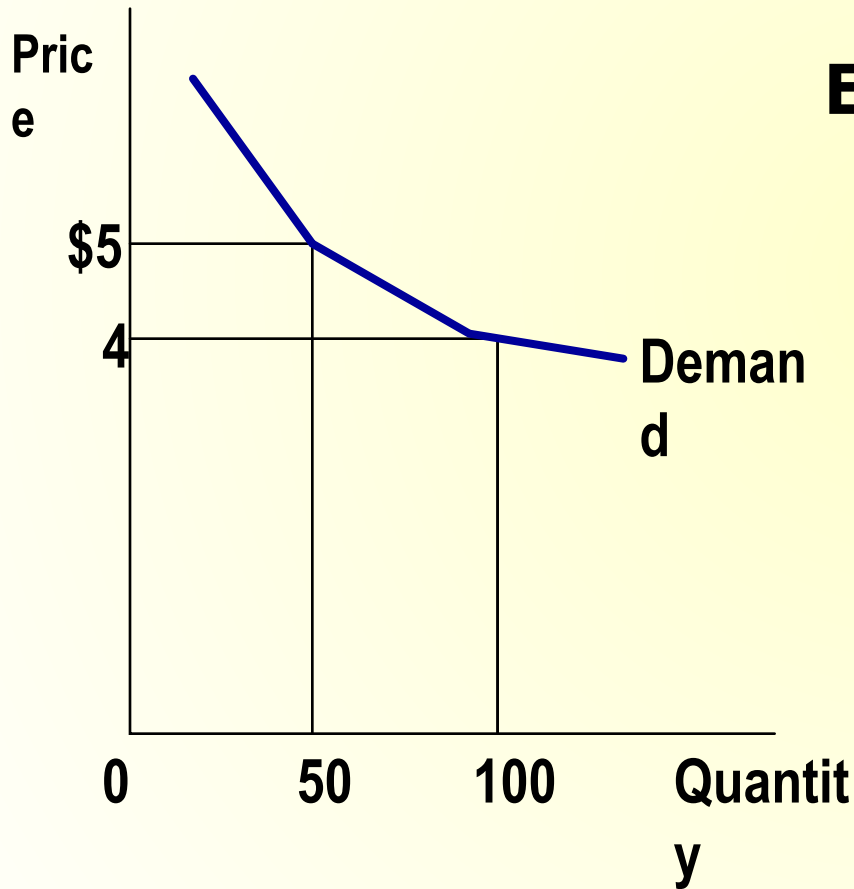
## *Inelastic Demand*

- 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*

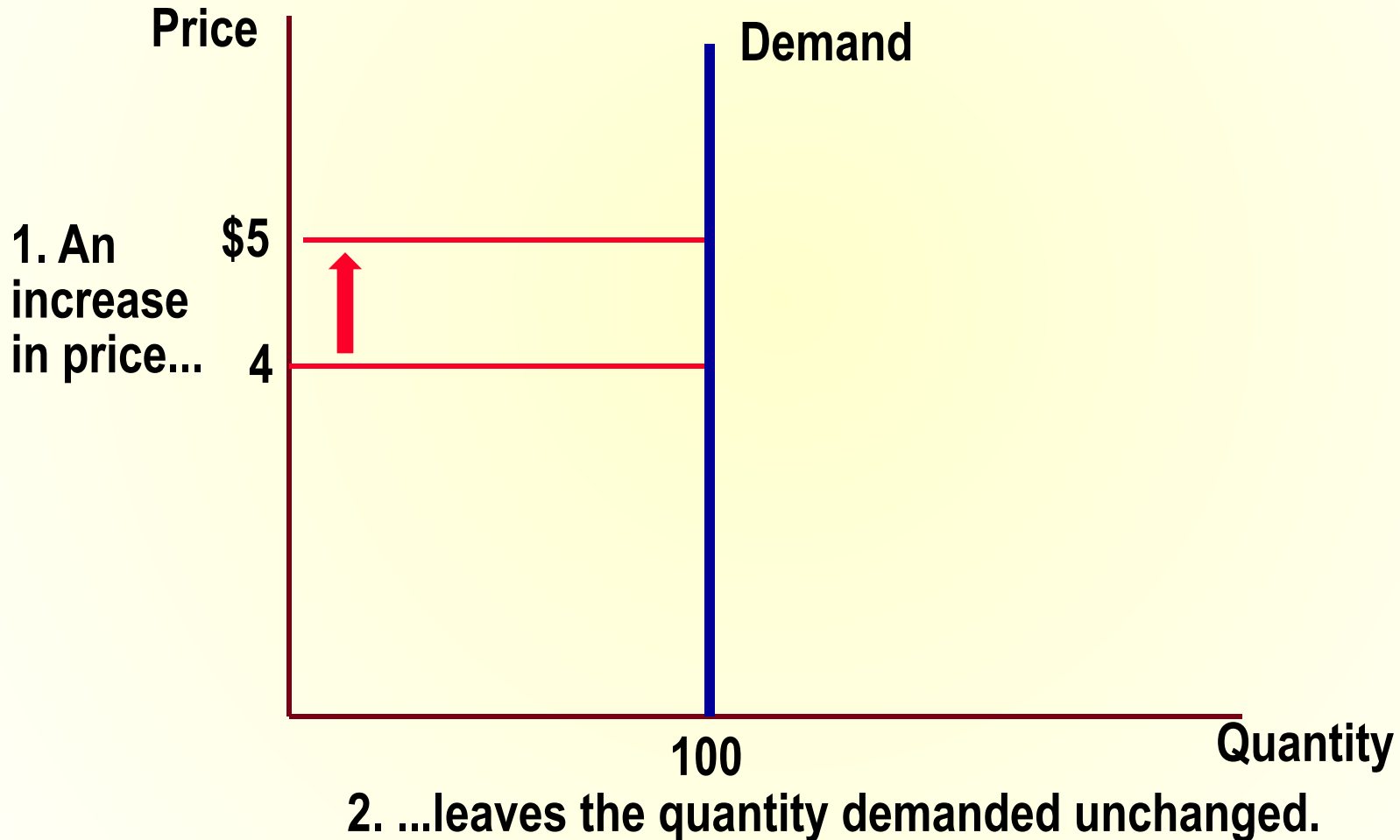
Quantity demanded changes by the same percentage as the price.

# **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.**

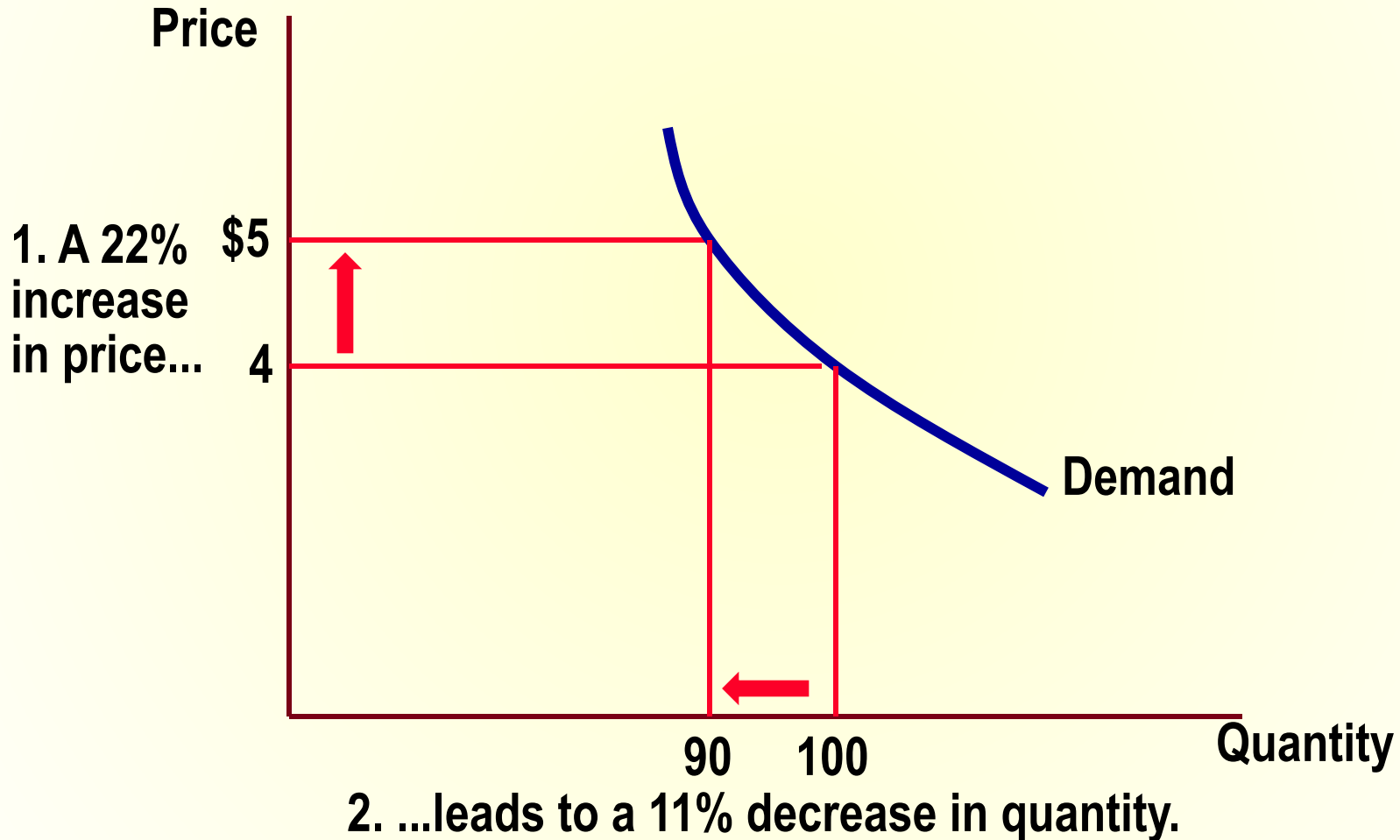
# Perfectly Inelastic Demand

## - Elasticity equals 0



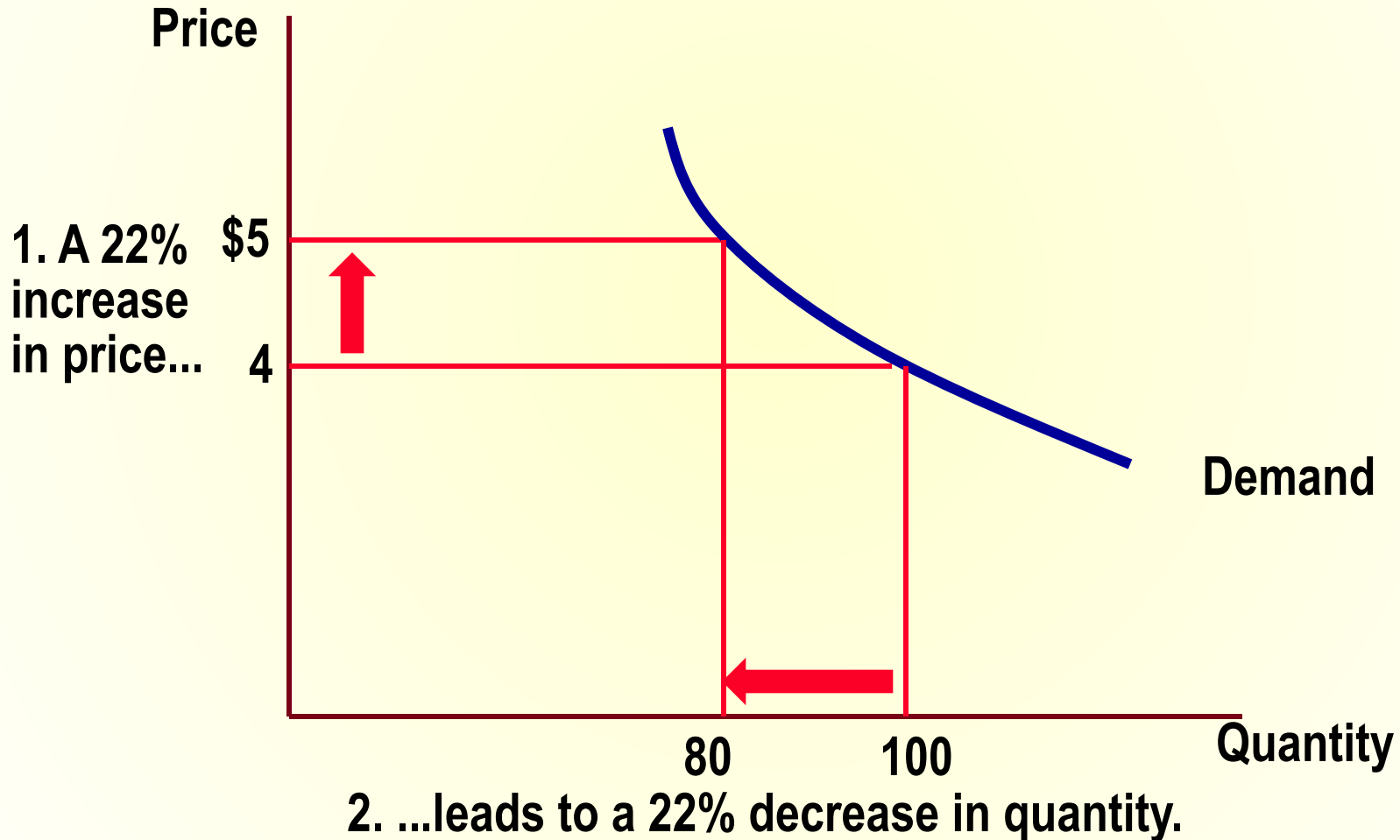
# Inelastic Demand

- Elasticity is less than 1



# Unit Elastic Demand

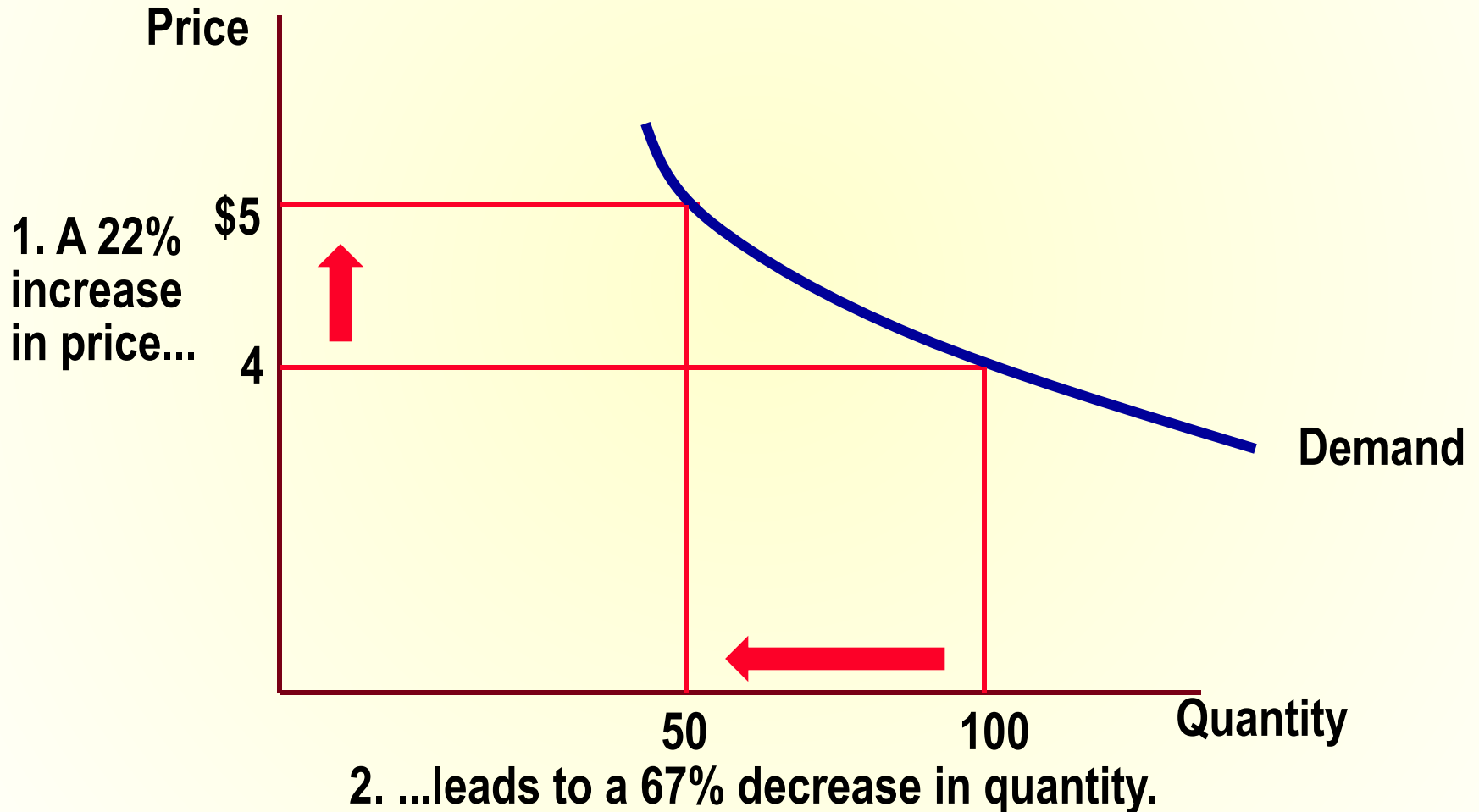
## - Elasticity equals 1





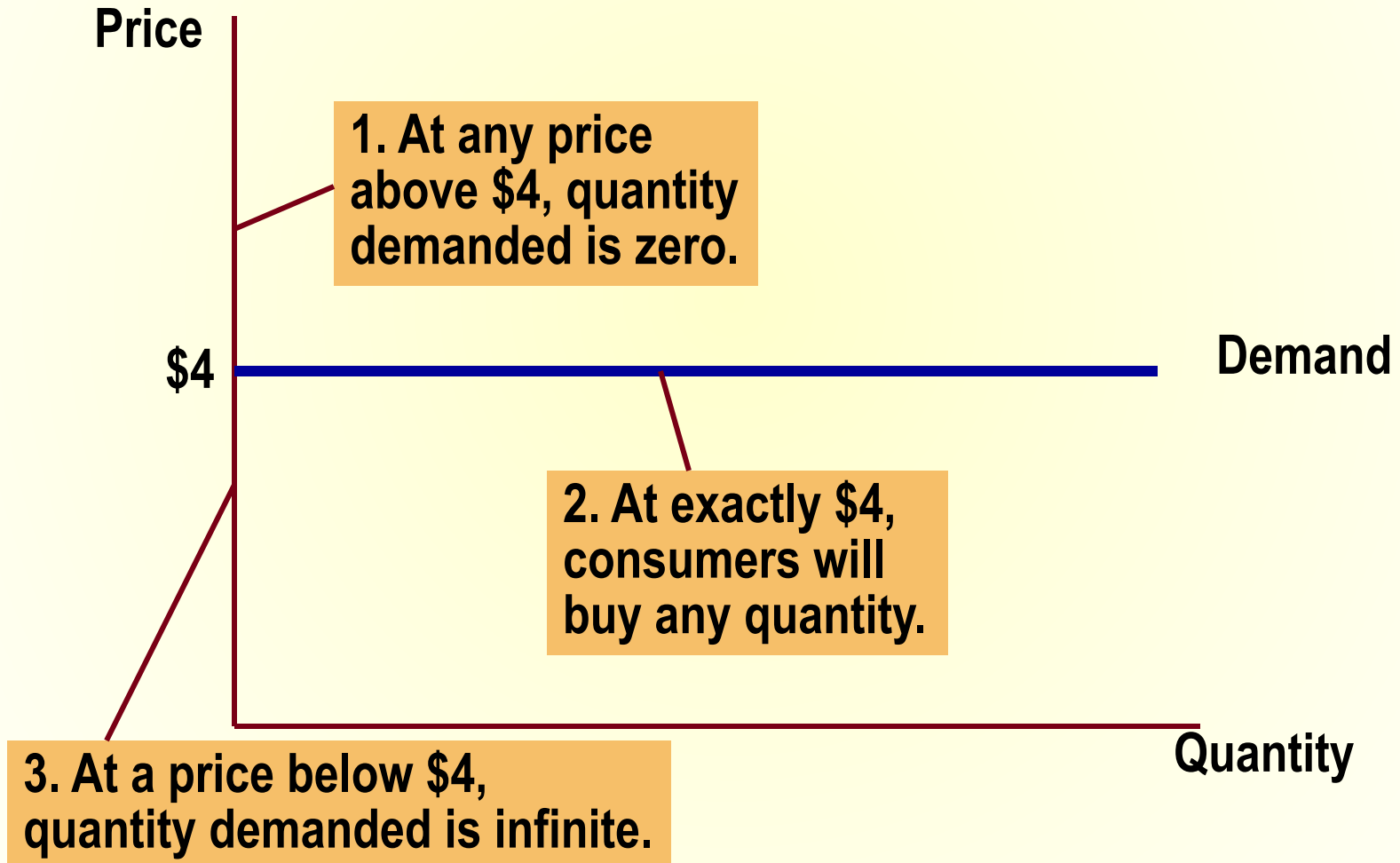
# Elastic Demand

- Elasticity is greater than 1



# Perfectly Elastic Demand

- Elasticity equals infinity

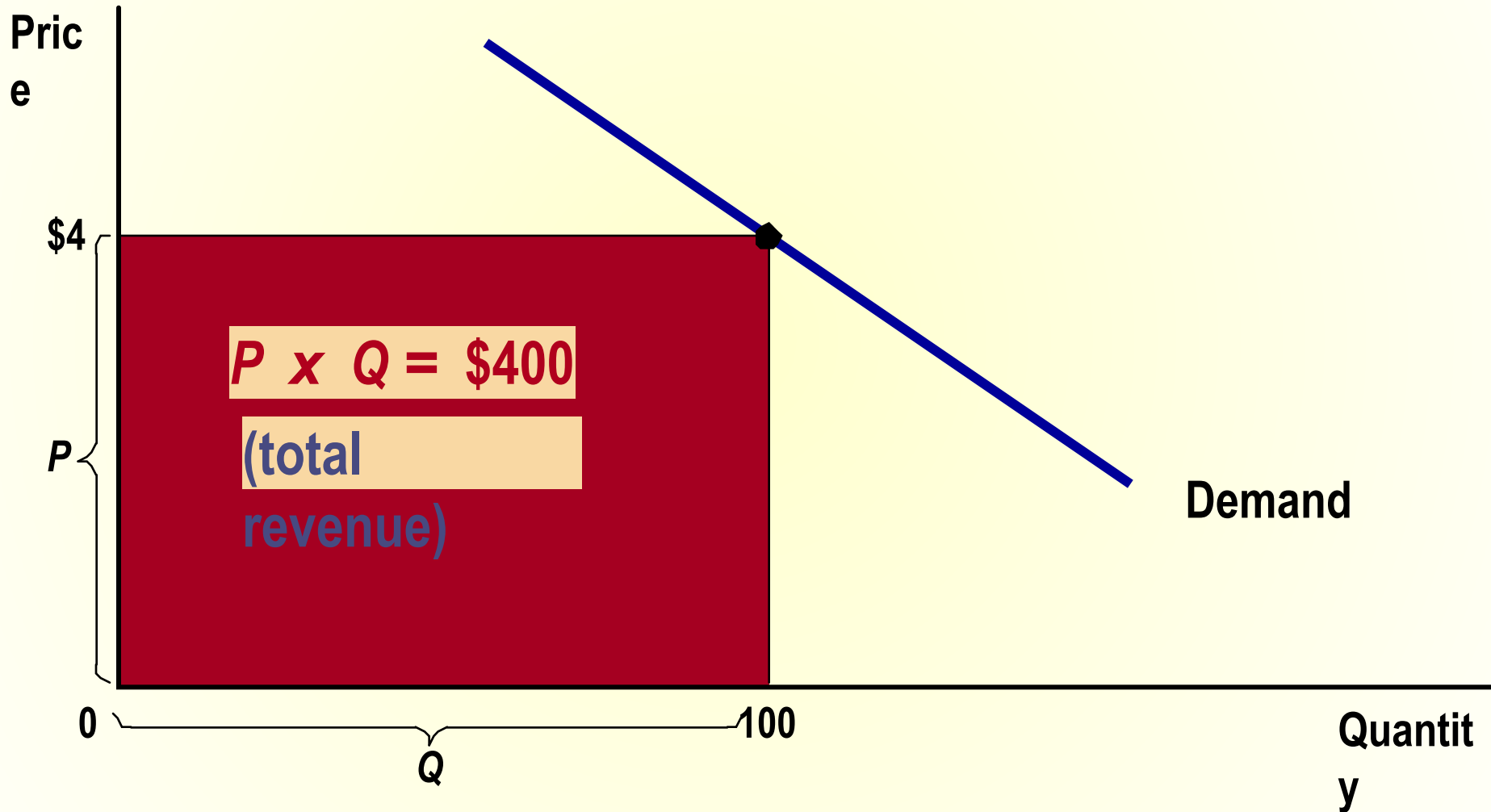


# Elasticity and Total Revenue

- **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.

$$TR = P \times Q$$

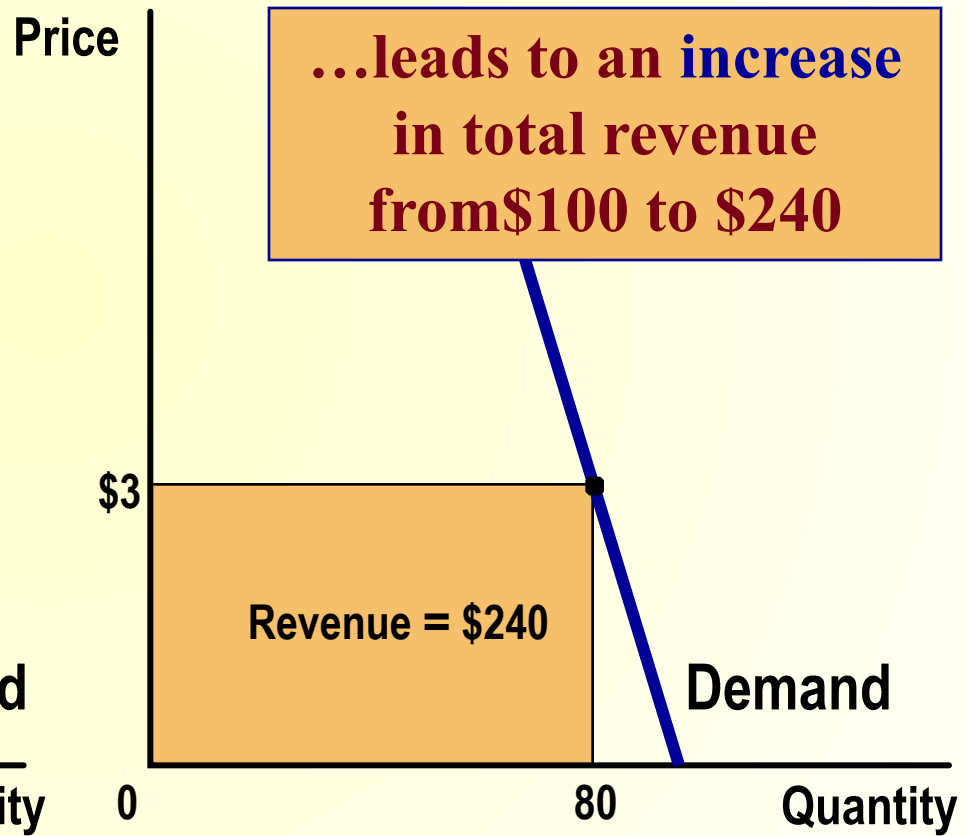
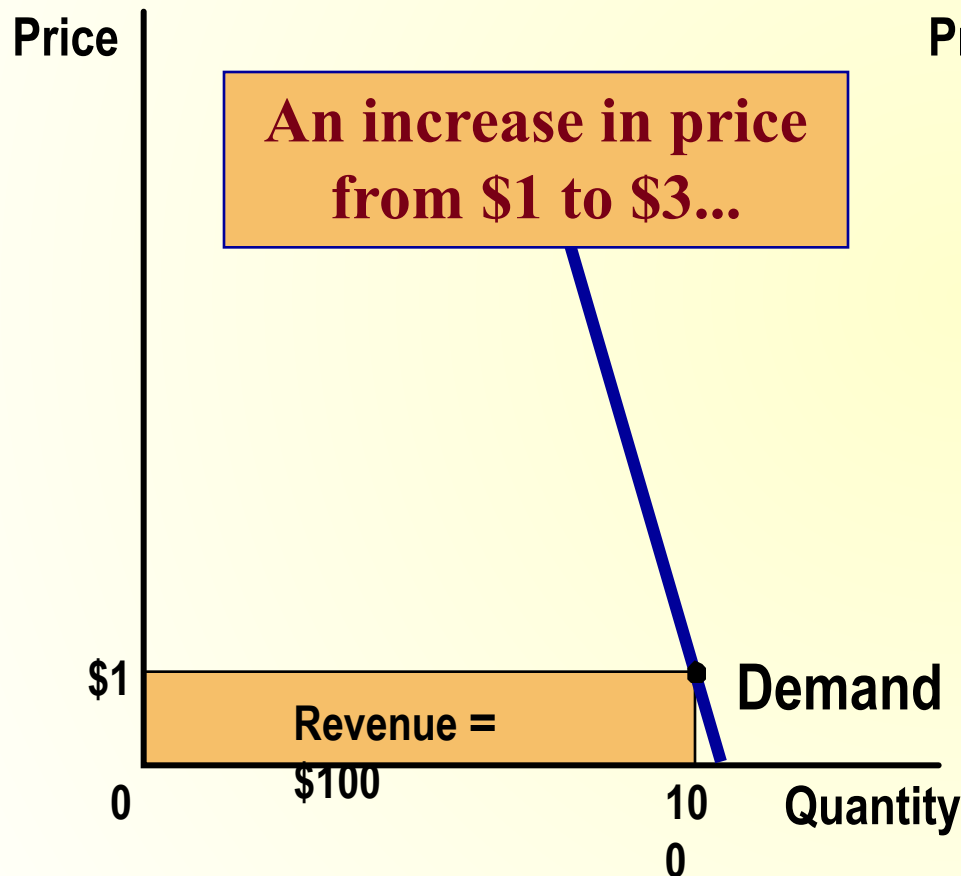
# Elasticity and Total Revenue



# 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.**

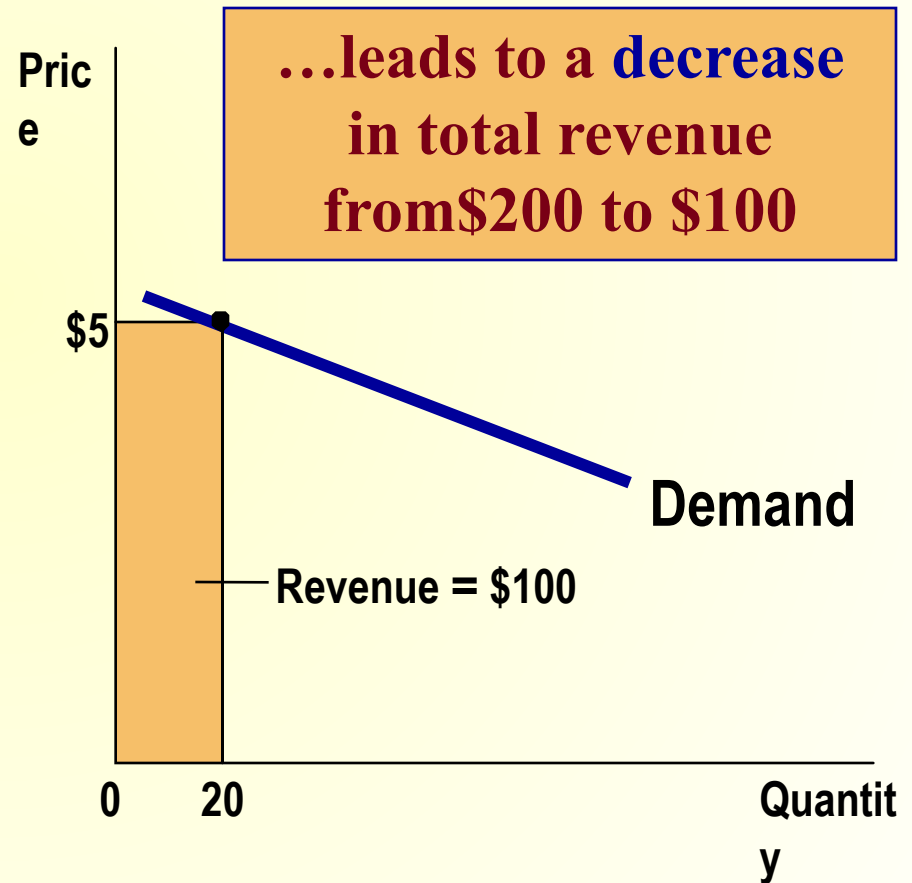
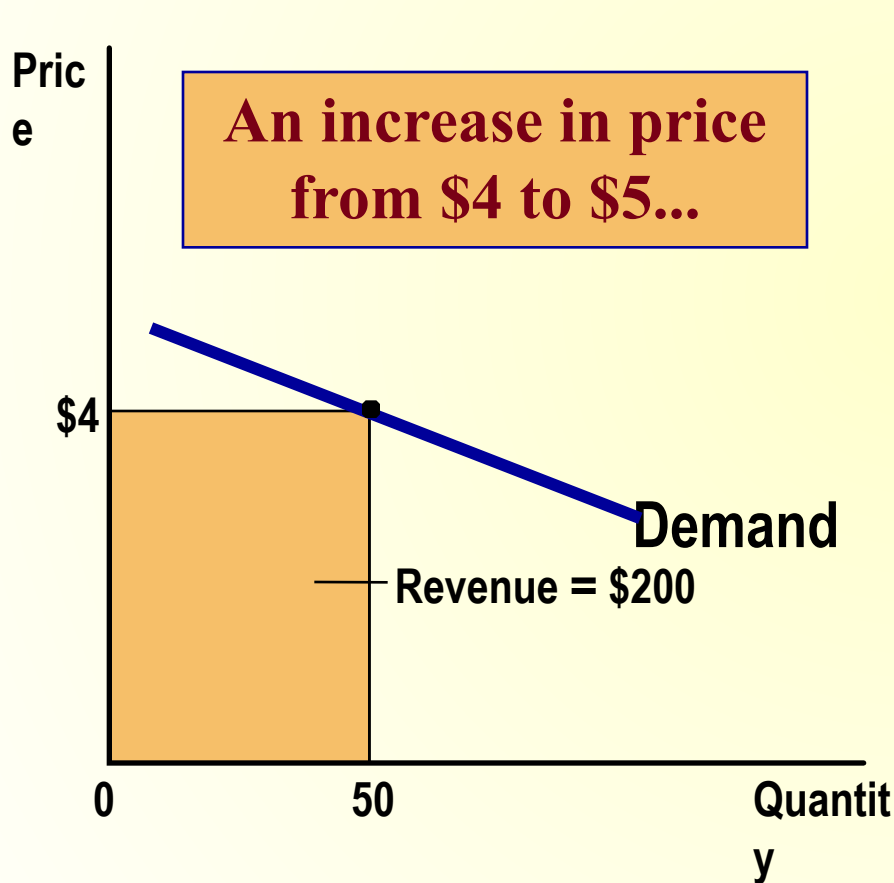
# Elasticity and Total Revenue: Inelastic Demand



# 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





# 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.

# 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**

$$E_s < 1$$

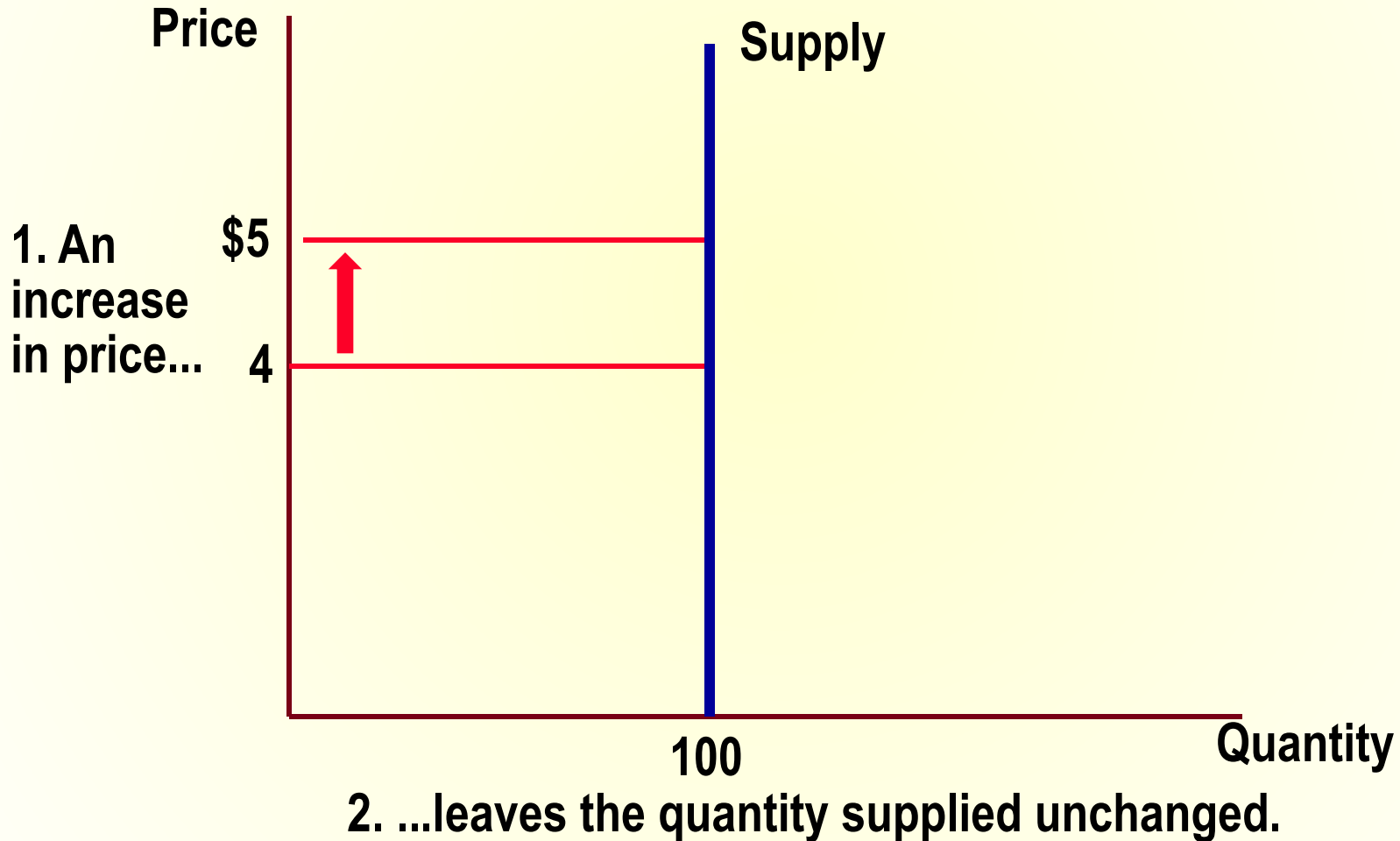
- **Perfectly Inelastic**

$$E_s = 0$$



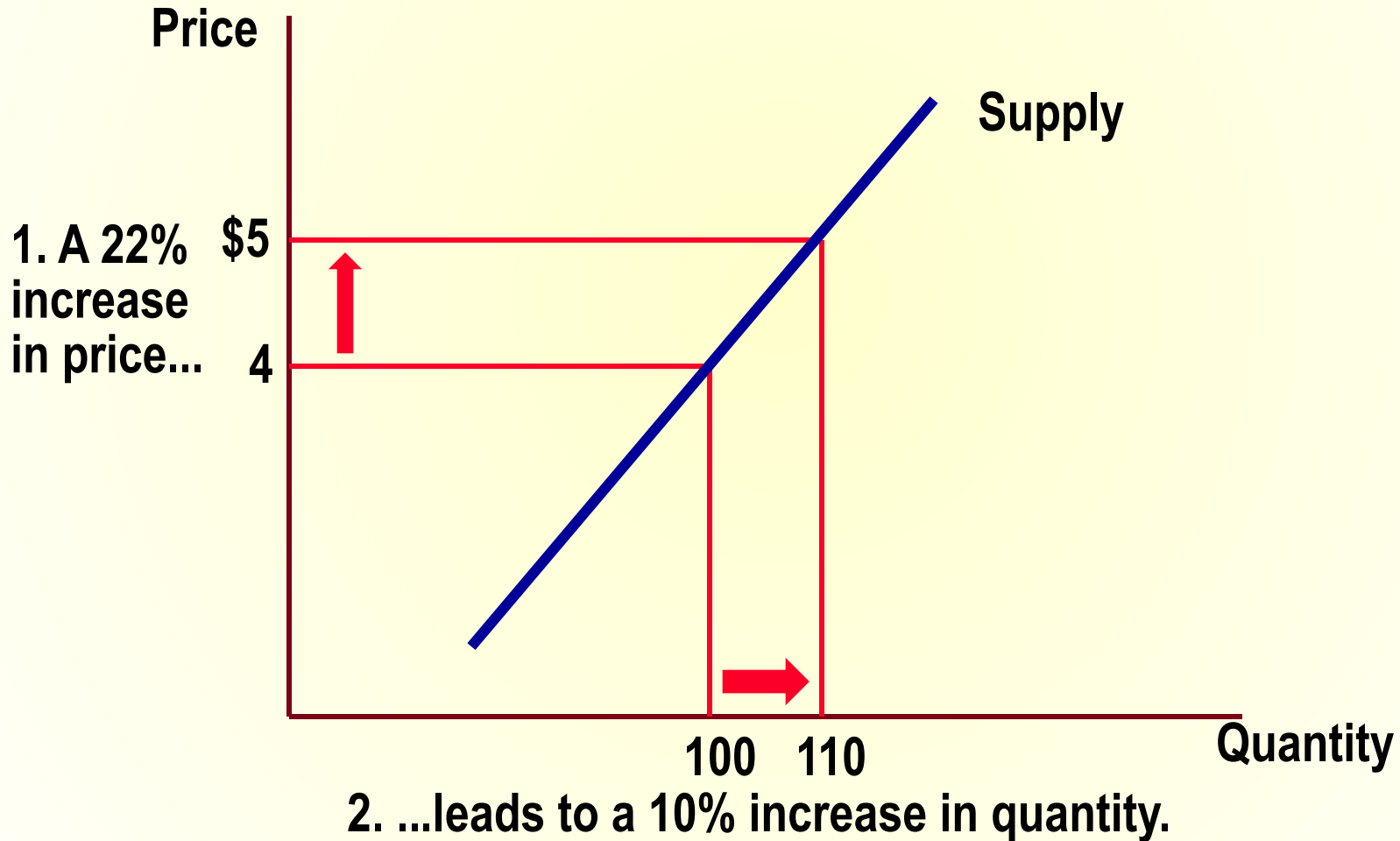
# Perfectly Inelastic Supply

## - Elasticity equals 0



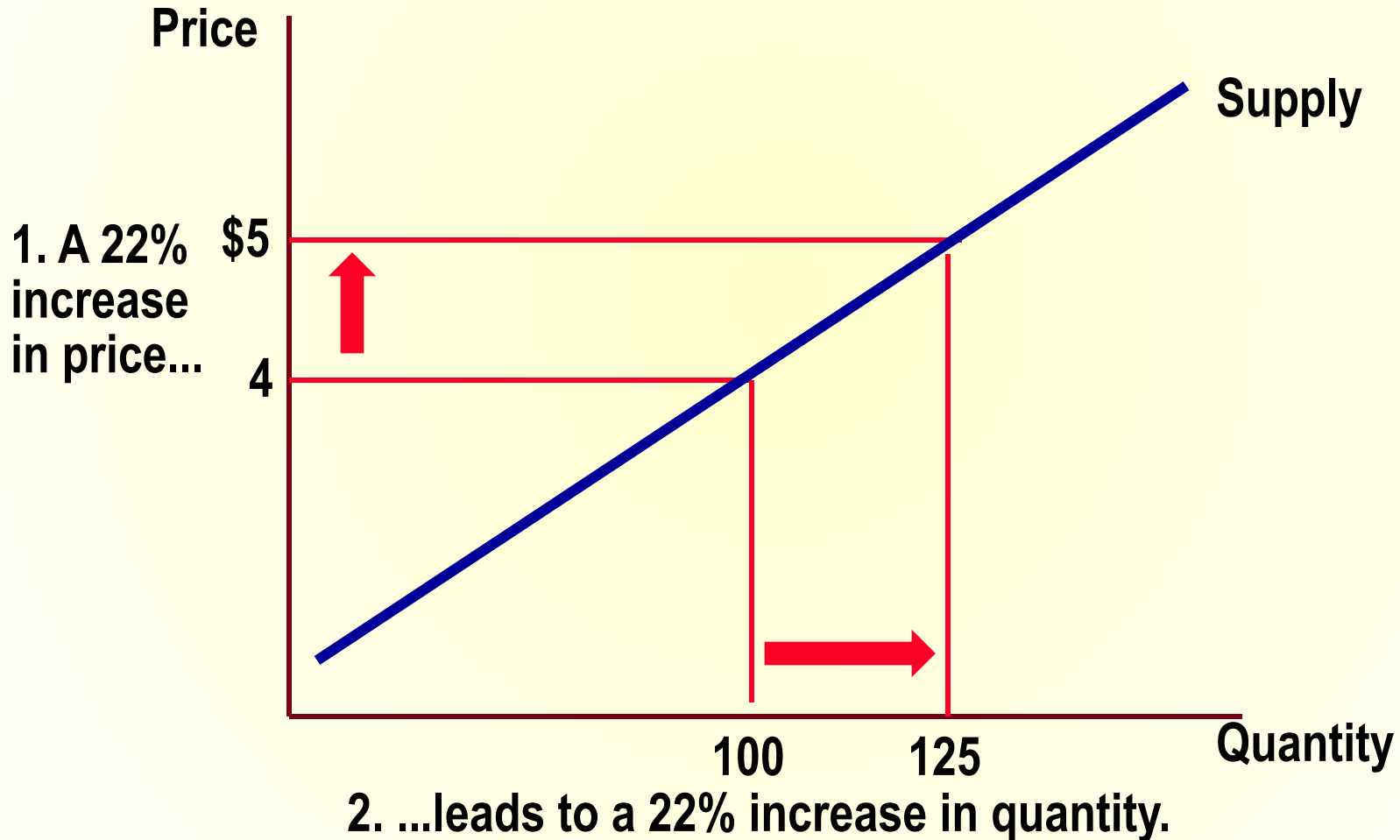
# Inelastic Supply

- Elasticity is less than 1



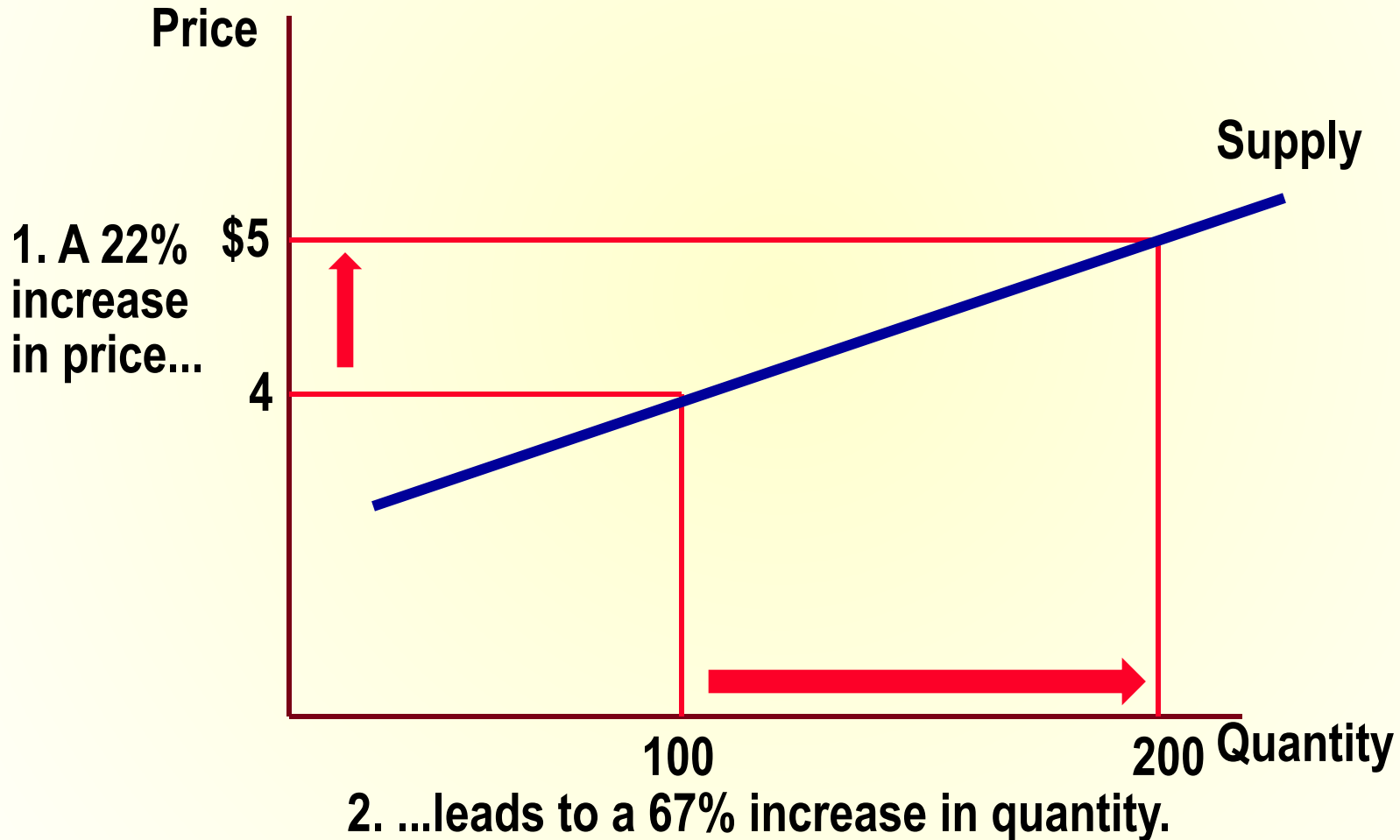
# Unit Elastic Supply

## - Elasticity equals 1



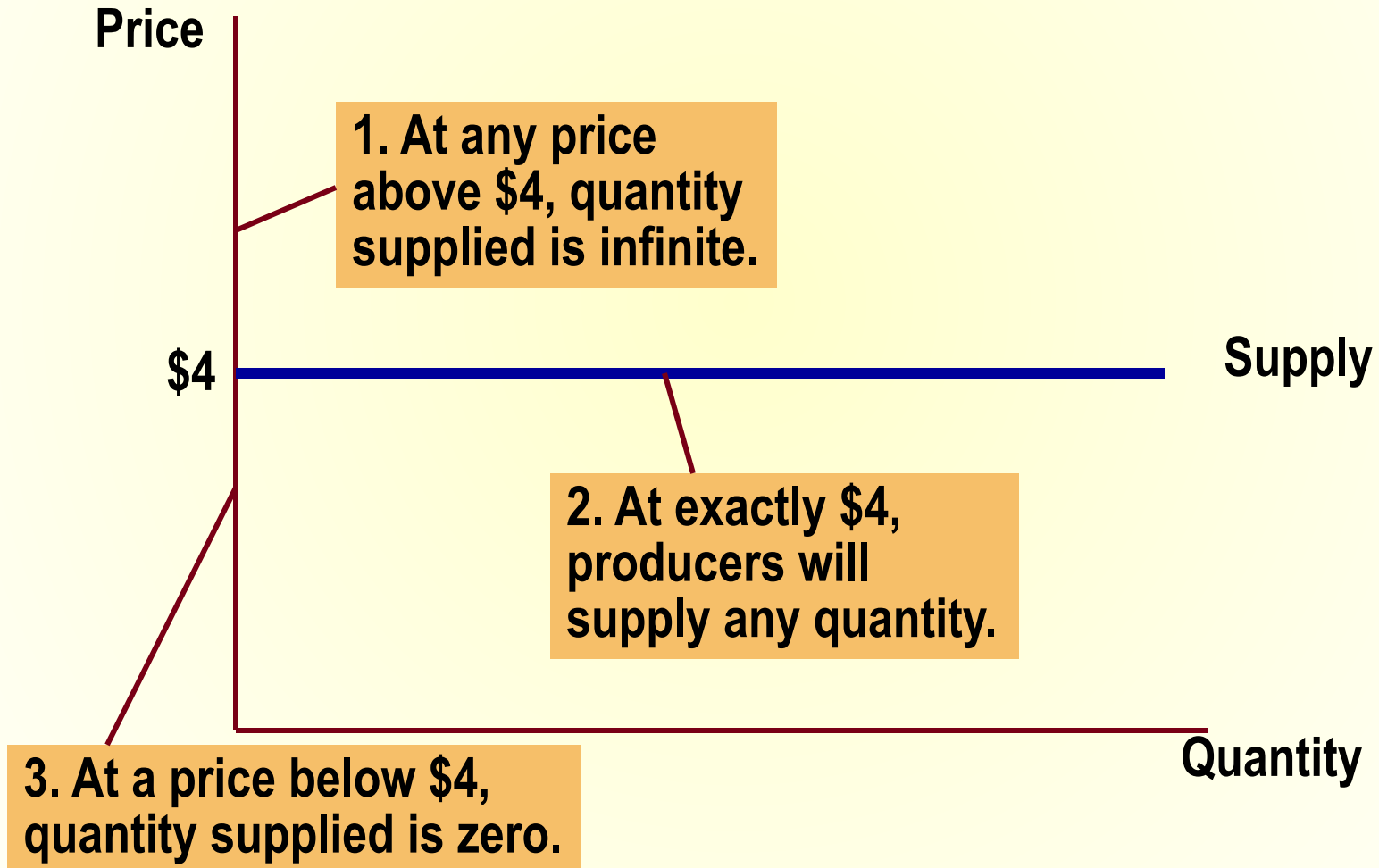
# Elastic Supply

- 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

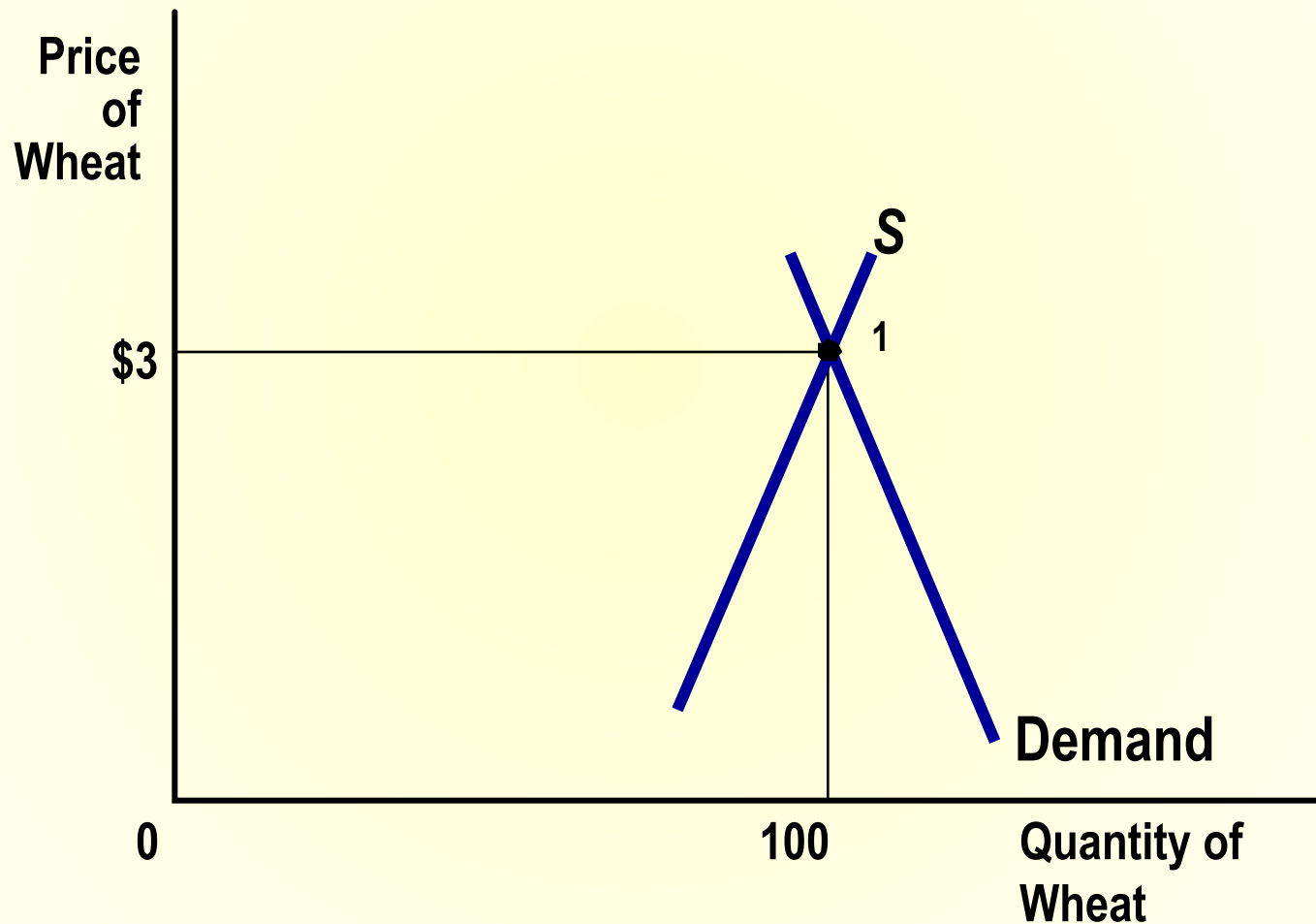
- **Can good news for farming be bad news for farmers?**
- **What happens to wheat farmers and the market for wheat when university agronomists discover a new wheat hybrid that is more productive than existing varieties?**



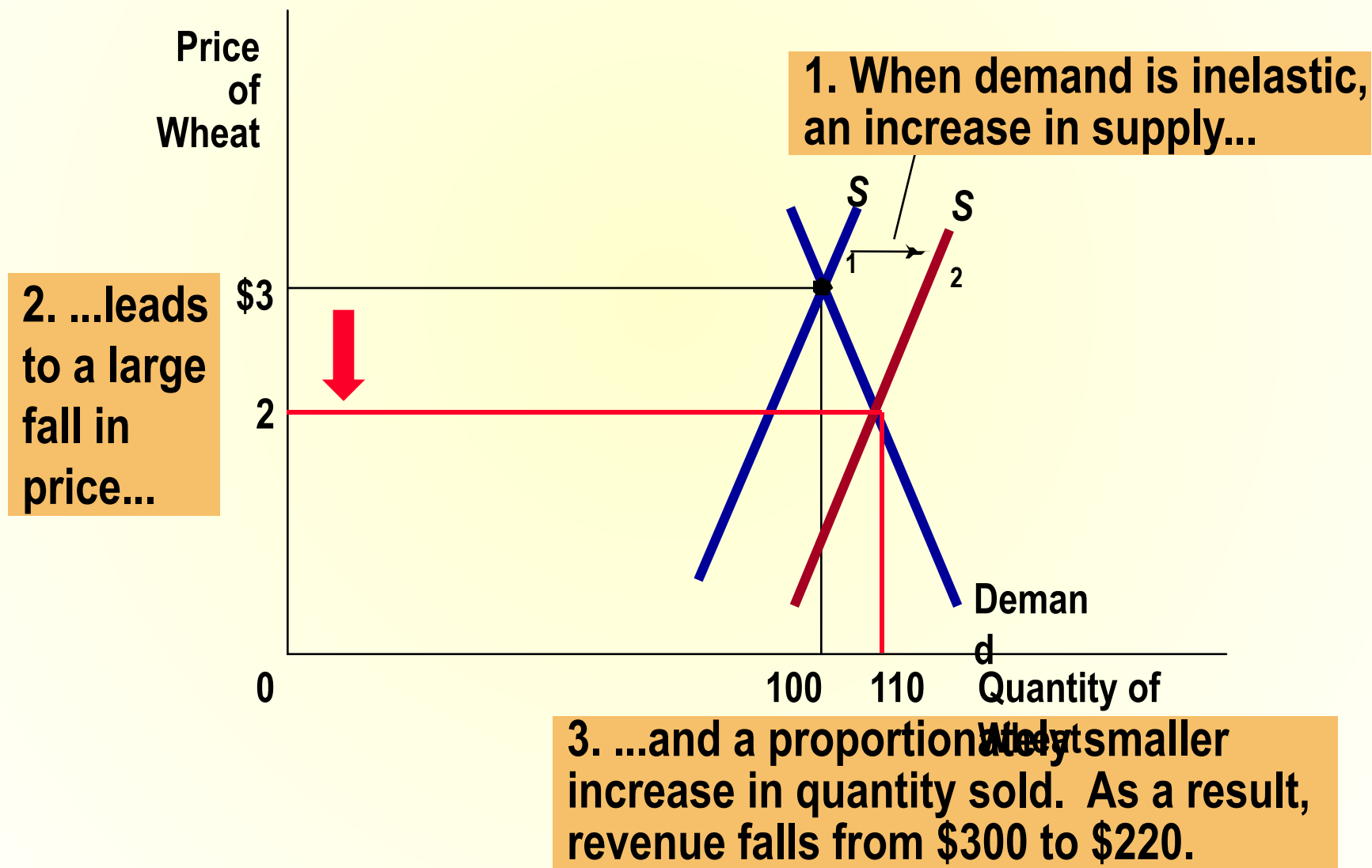
# Application of Elasticity

- **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

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

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

# Compute Elasticity

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

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

***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.**

# Summary

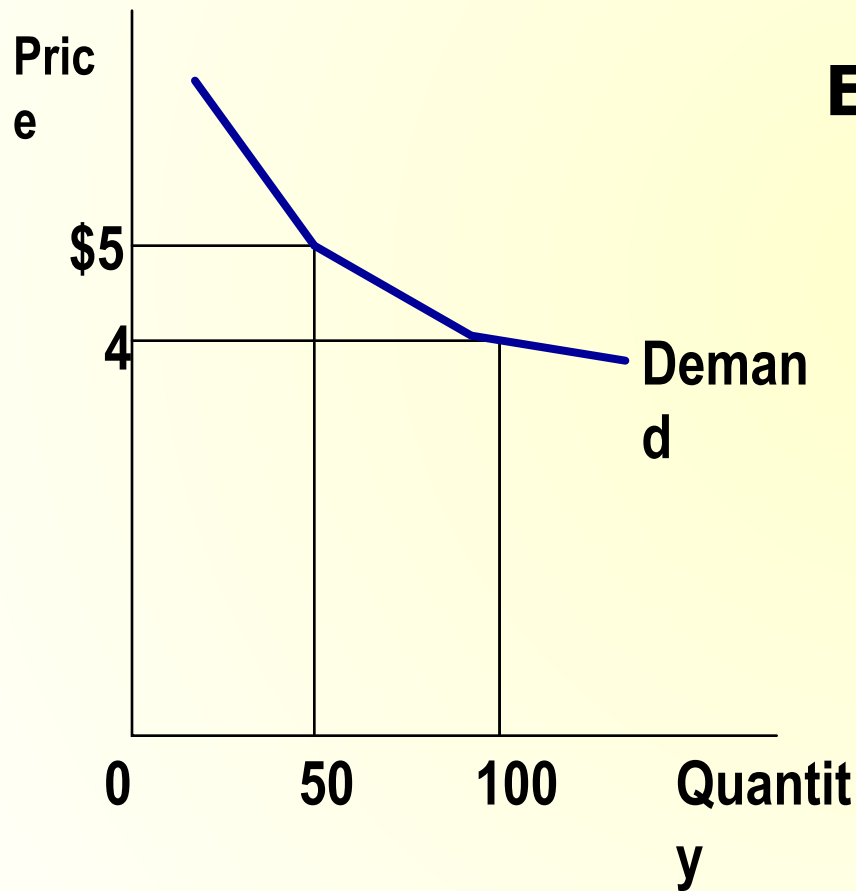
- **The price elasticity of supply measures how much the quantity supplied responds to changes in the price.**
- **In most markets, supply is more elastic in the long run than in the short run.**



# Graphical Review



# Computing the Price Elasticity of Demand



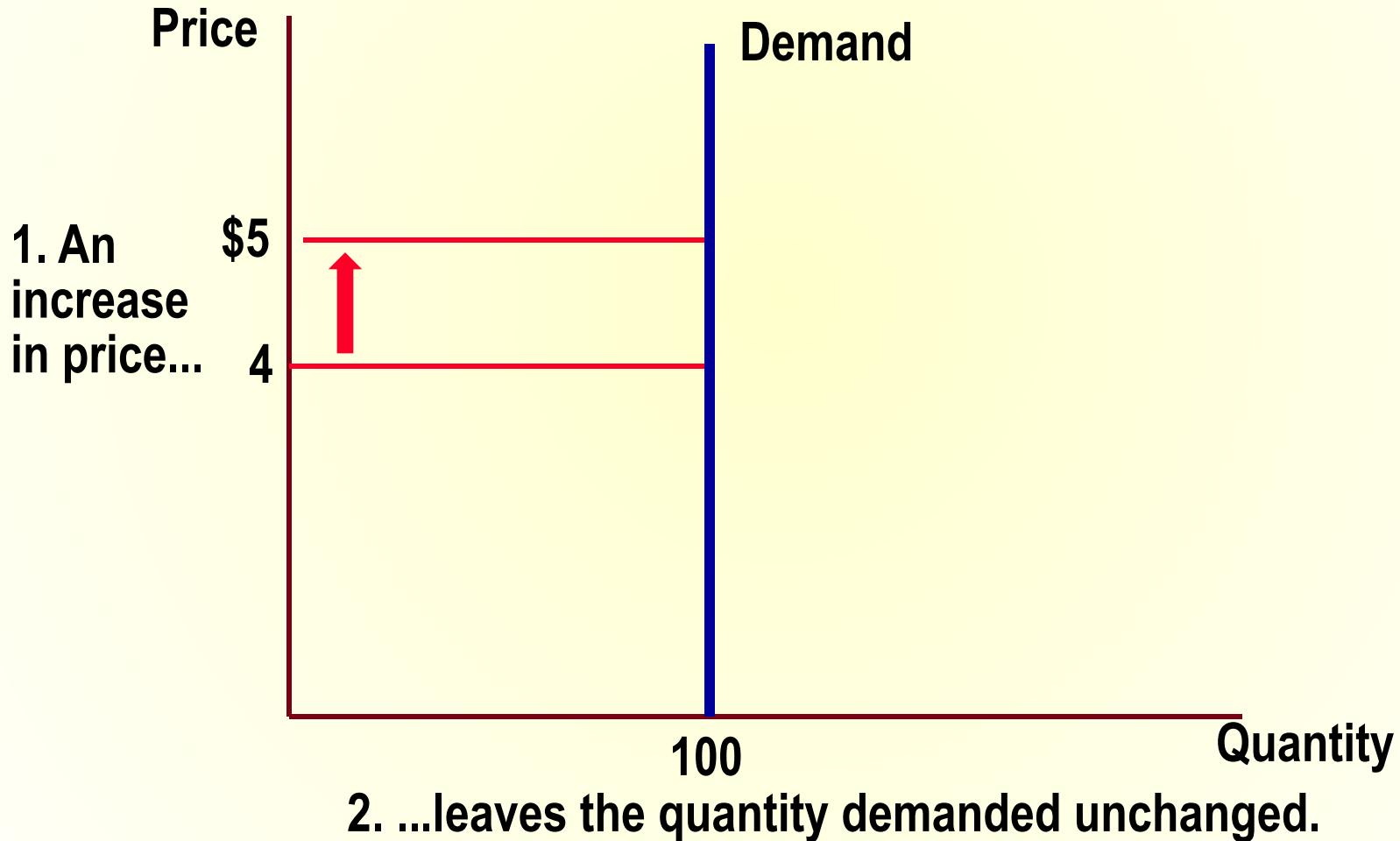
$$E_D = \frac{(100 - 50) / ((100 + 50) / 2)}{(4.00 - 5.00) / ((4.00 + 5.00) / 2)}$$

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

***Demand is price elastic***

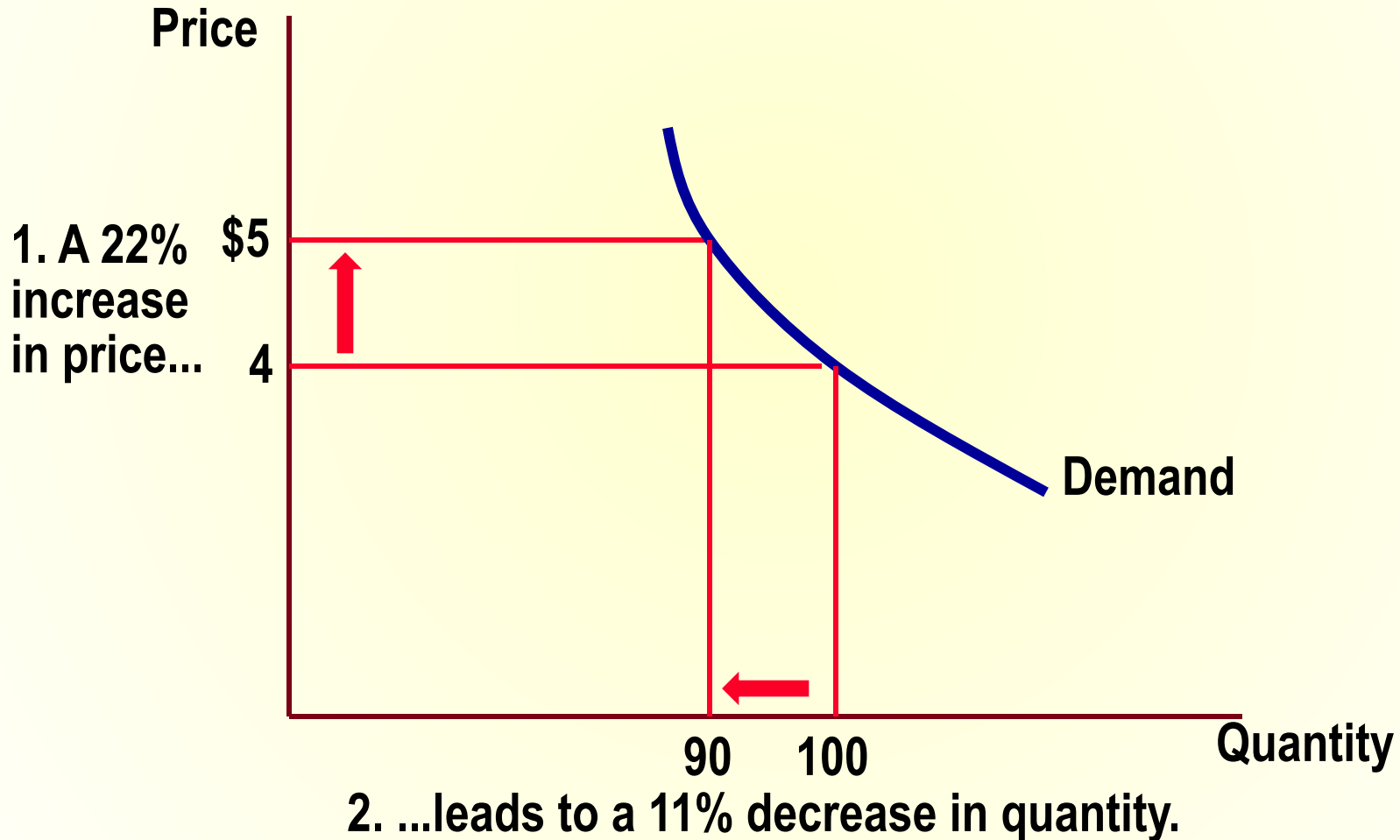
# Perfectly Inelastic Demand

## - Elasticity equals 0



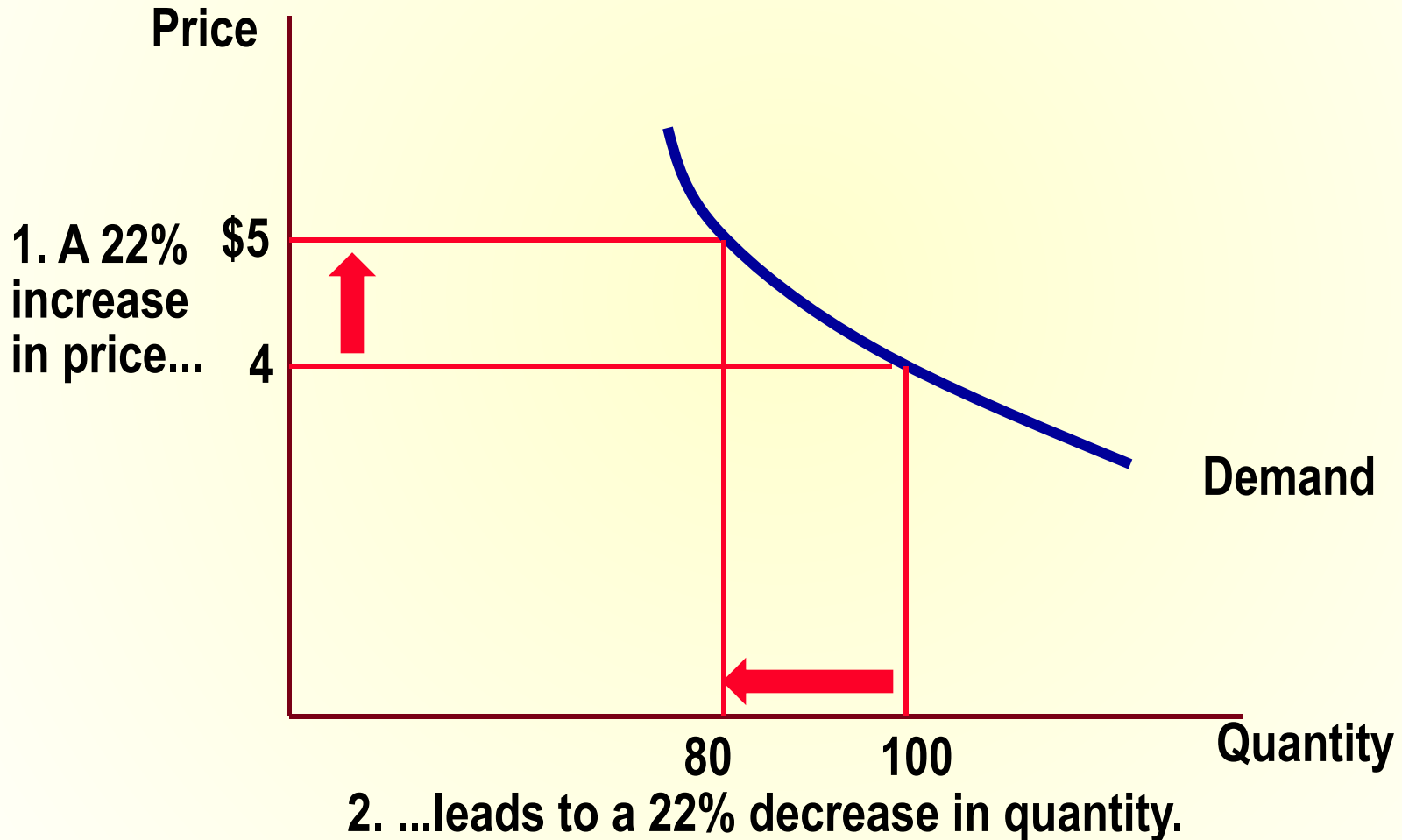
# Inelastic Demand

- Elasticity is less than 1



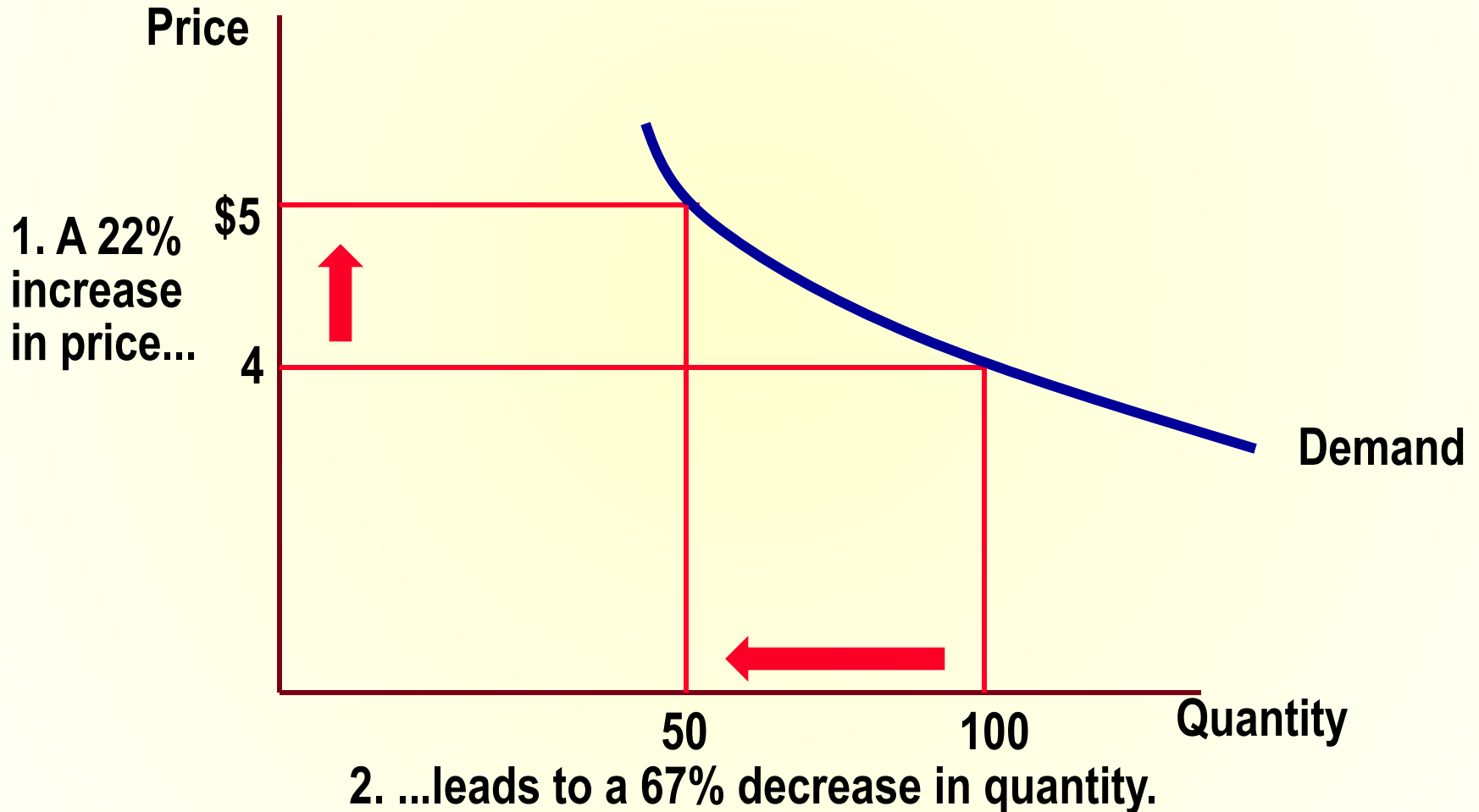
# Unit Elastic Demand

## - Elasticity equals 1



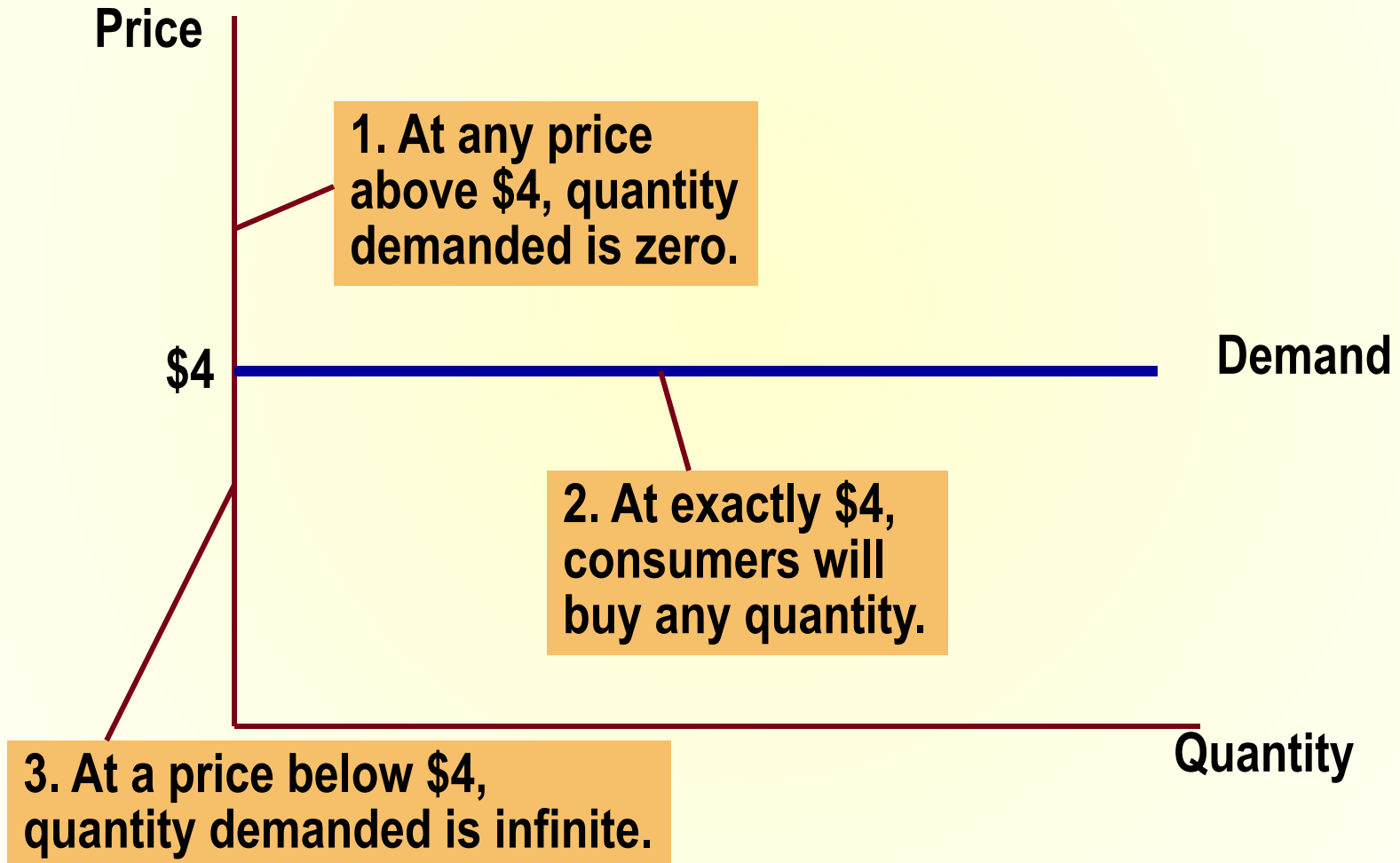
# Elastic Demand

- Elasticity is greater than 1

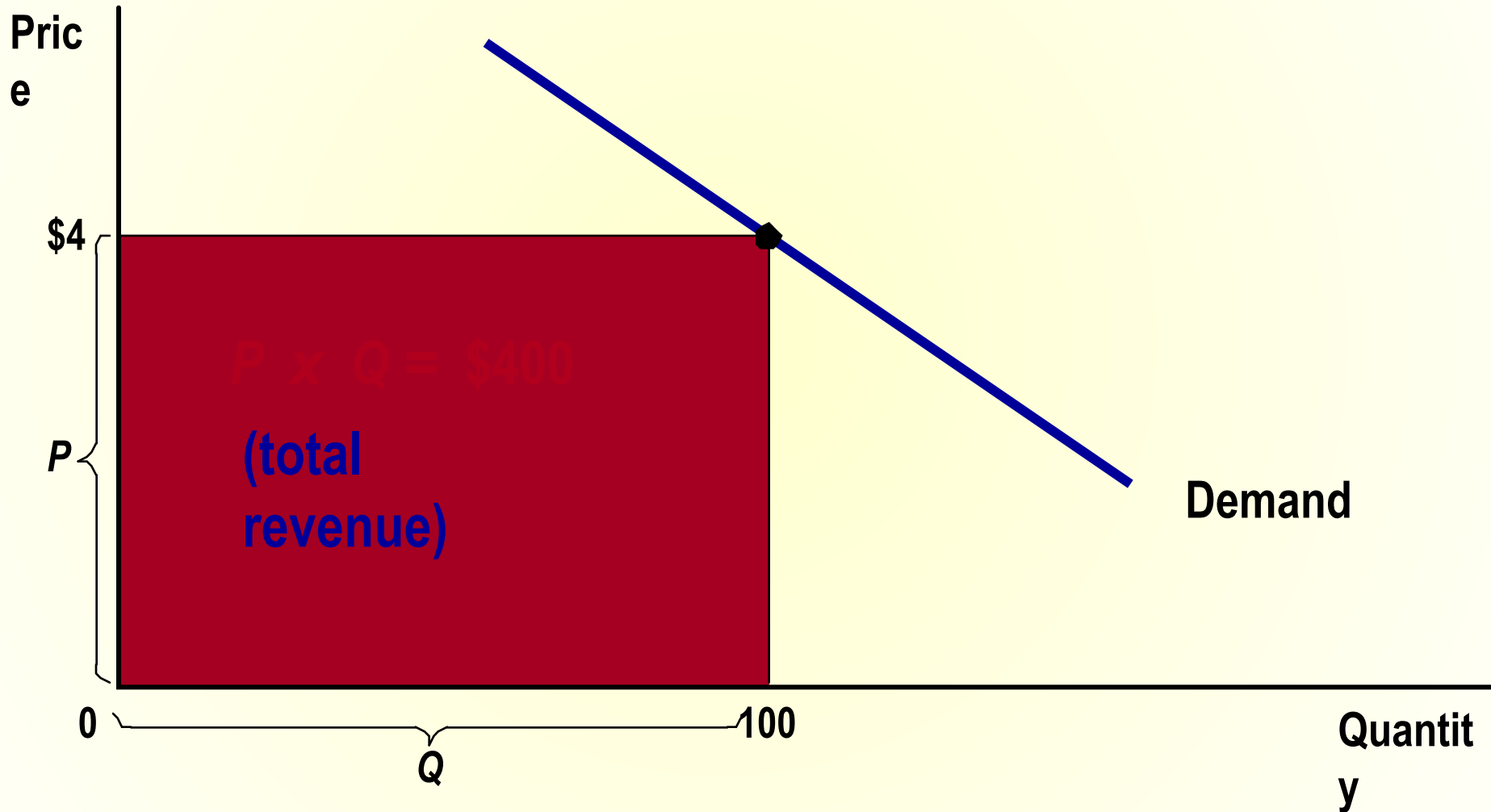


# Perfectly Elastic Demand

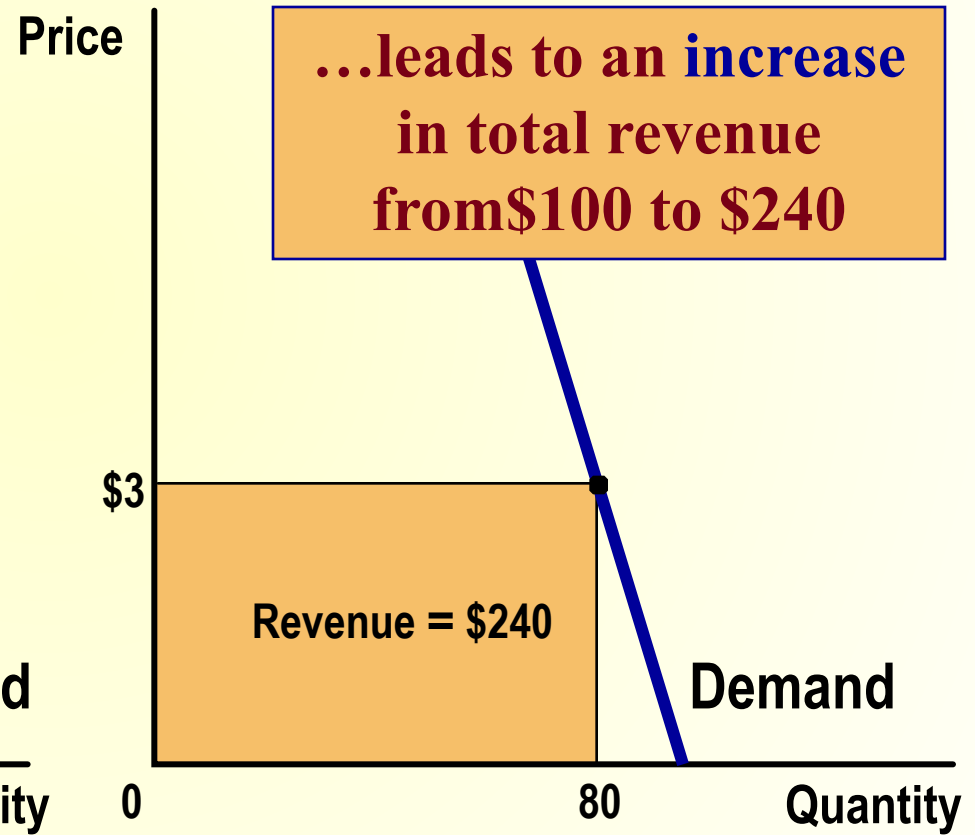
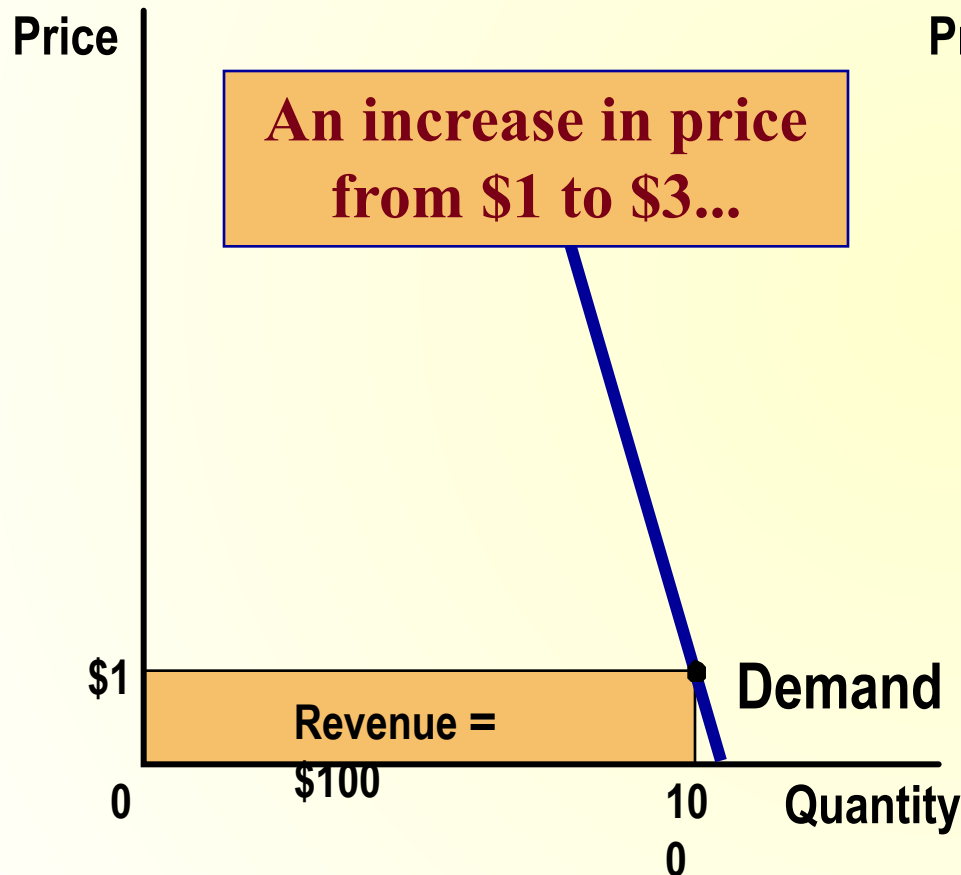
- Elasticity equals infinity



# Elasticity and Total Revenue

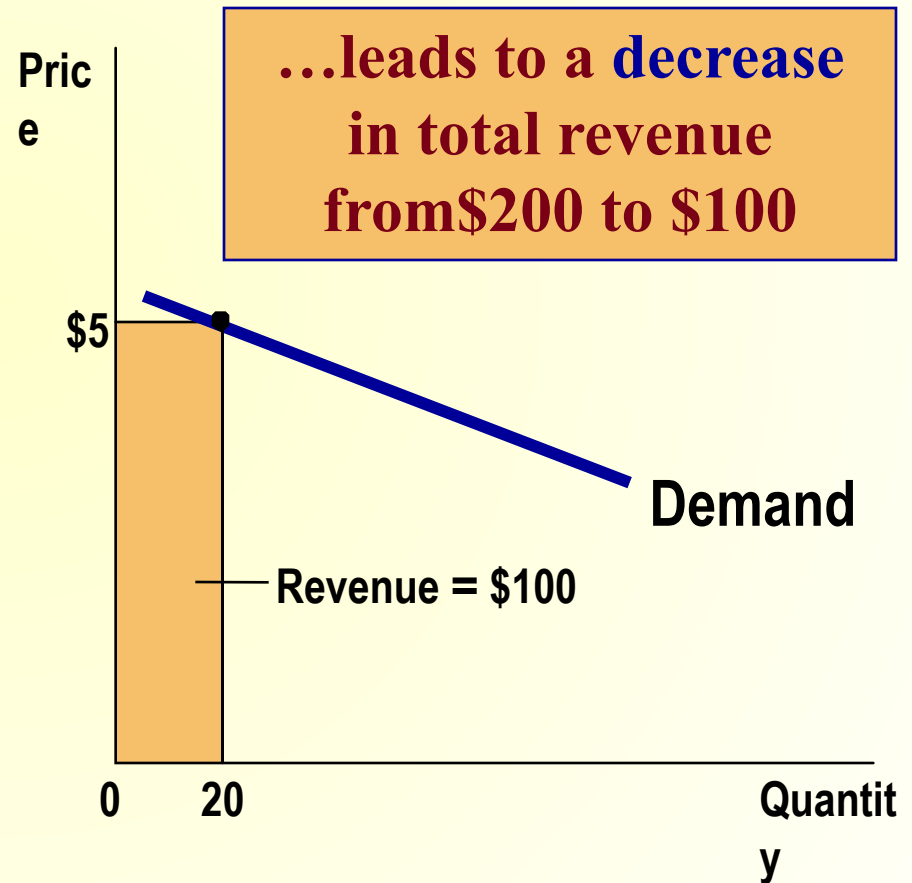
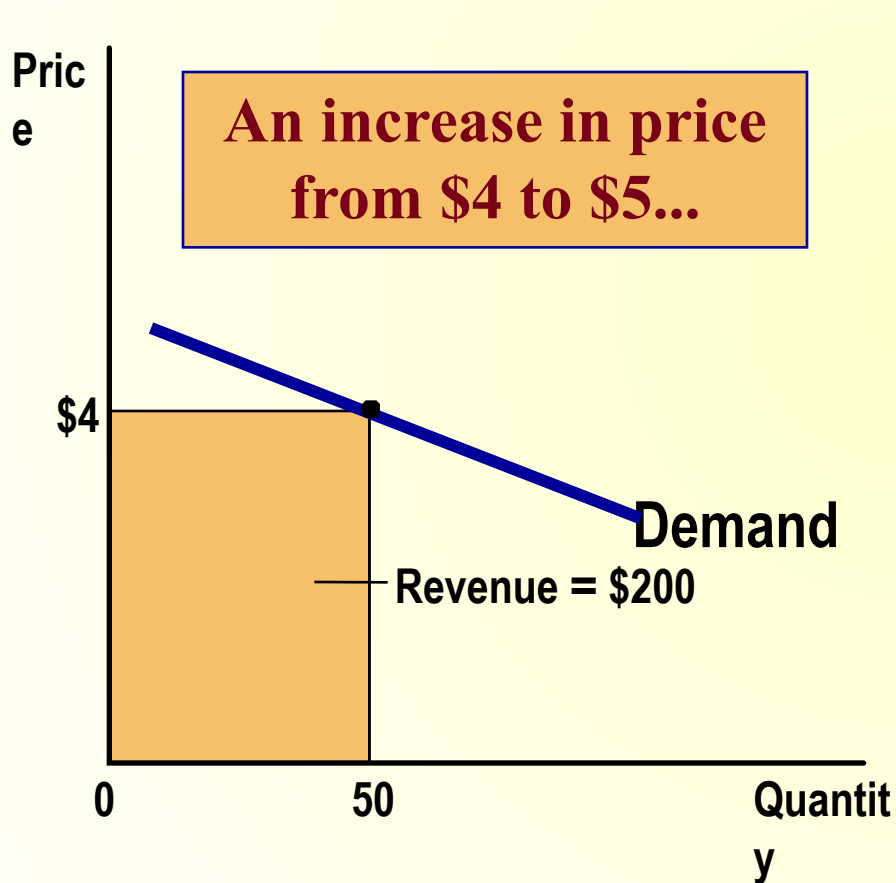


# Elasticity and Total Revenue: Inelastic Demand



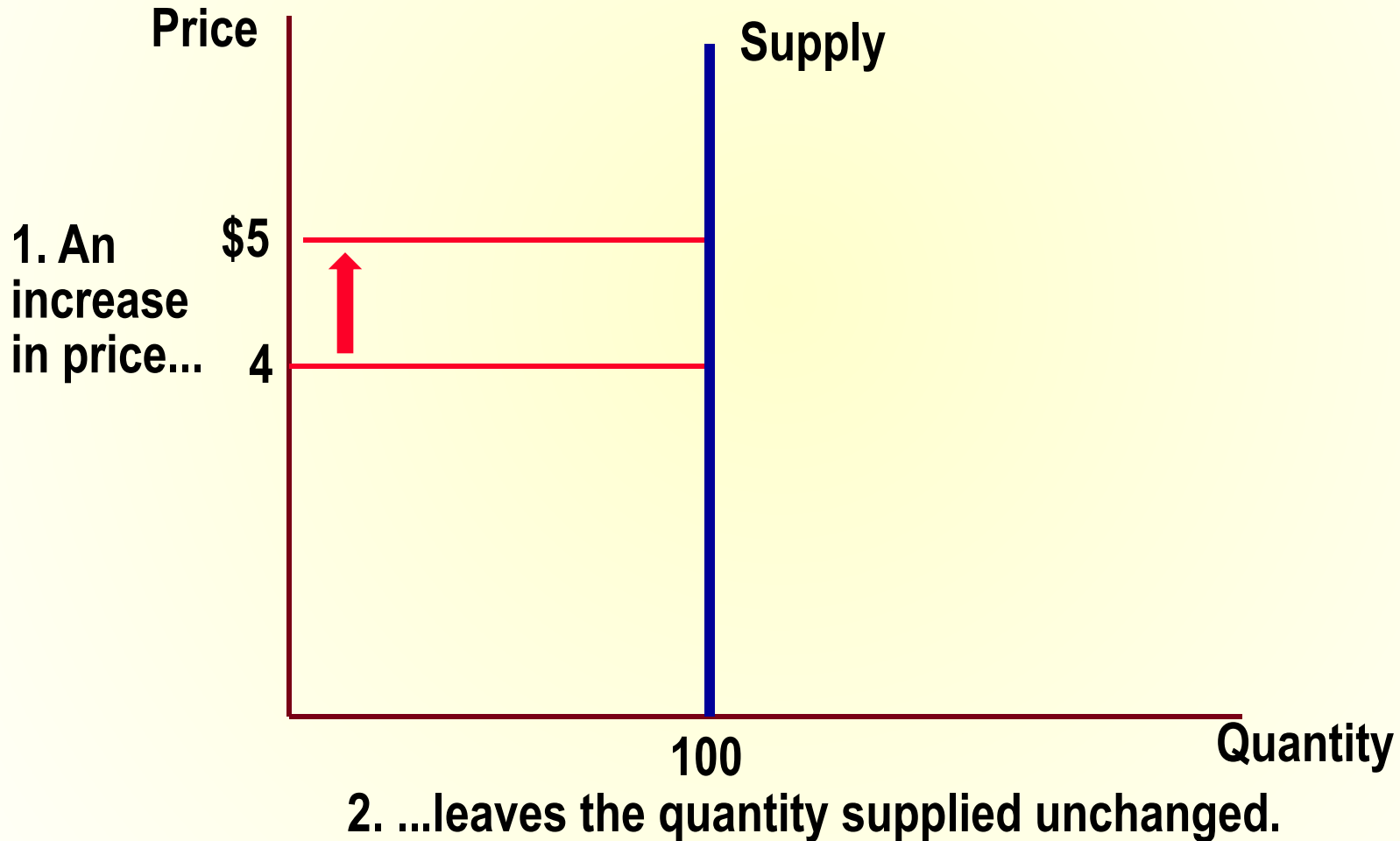


# Elasticity and Total Revenue: Elastic Demand



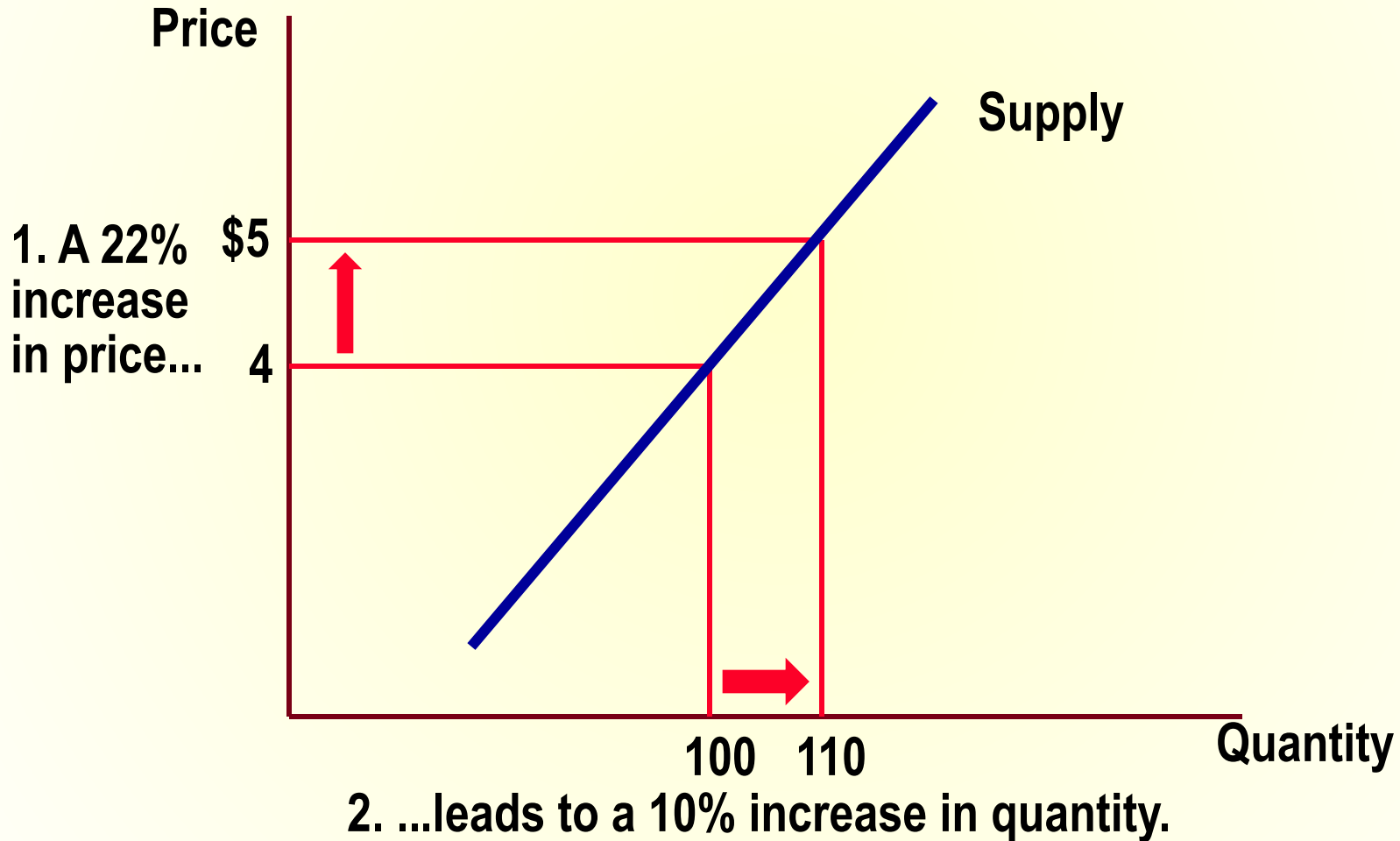
# Perfectly Inelastic Supply

## - Elasticity equals 0



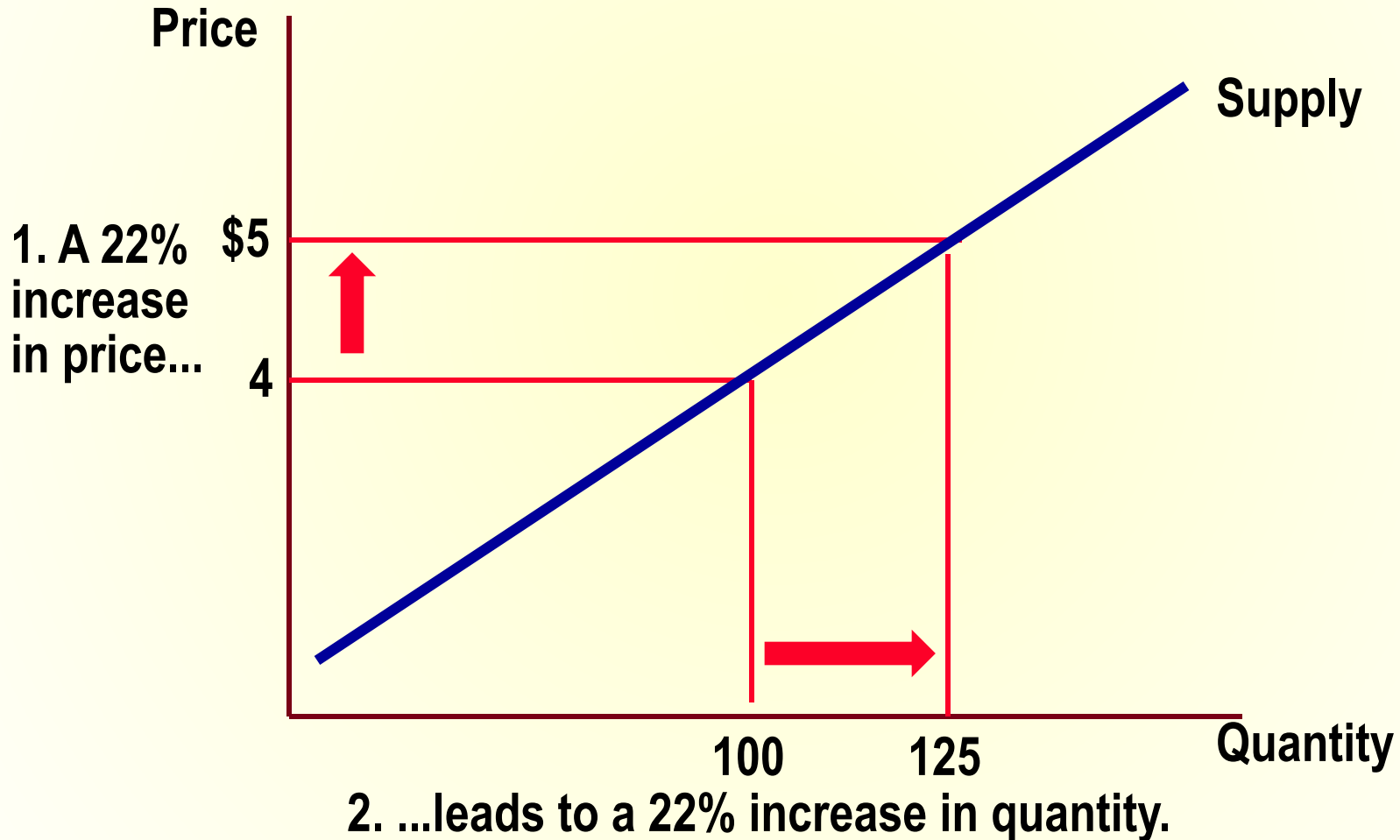
# Inelastic Supply

- Elasticity is less than 1



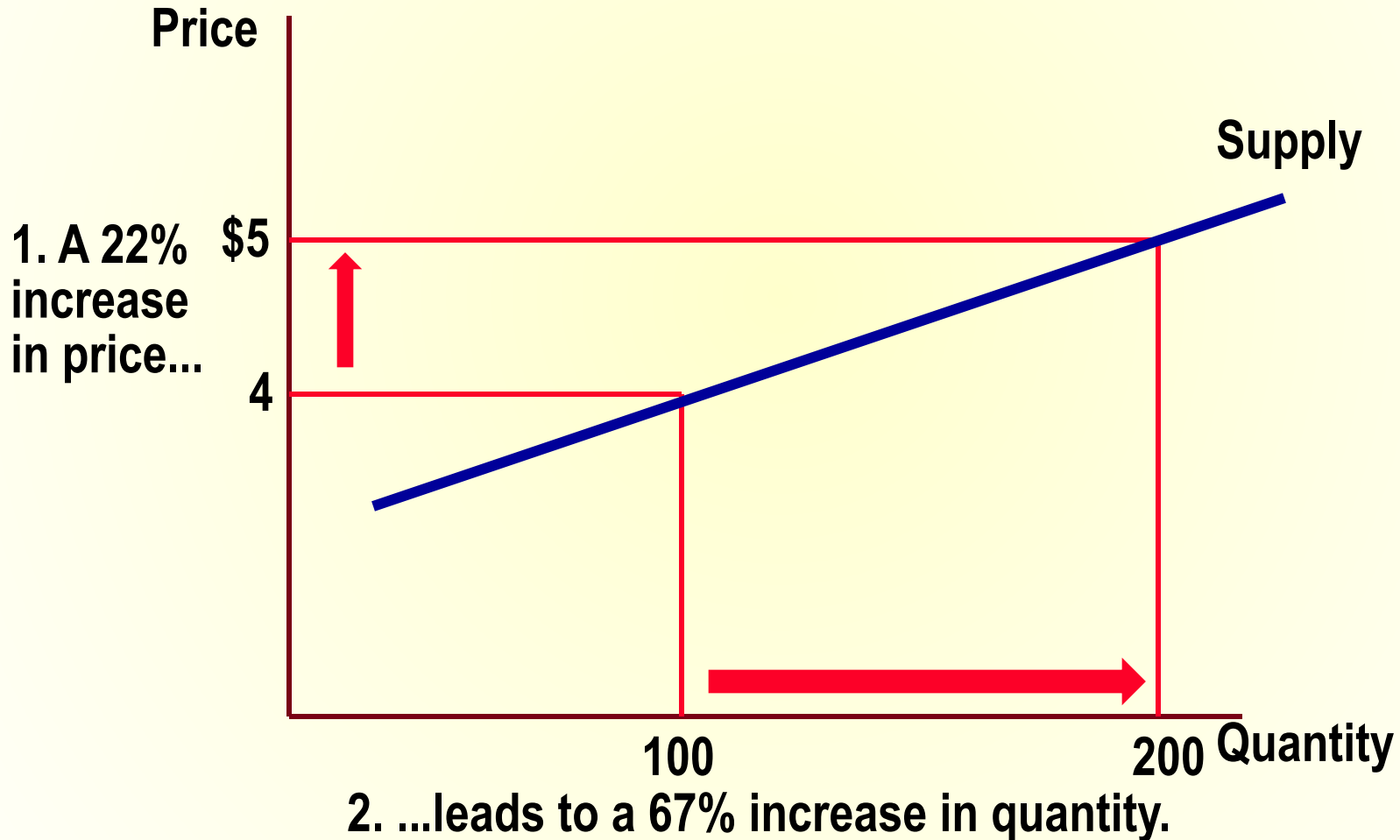
# Unit Elastic Supply

- Elasticity equals 1



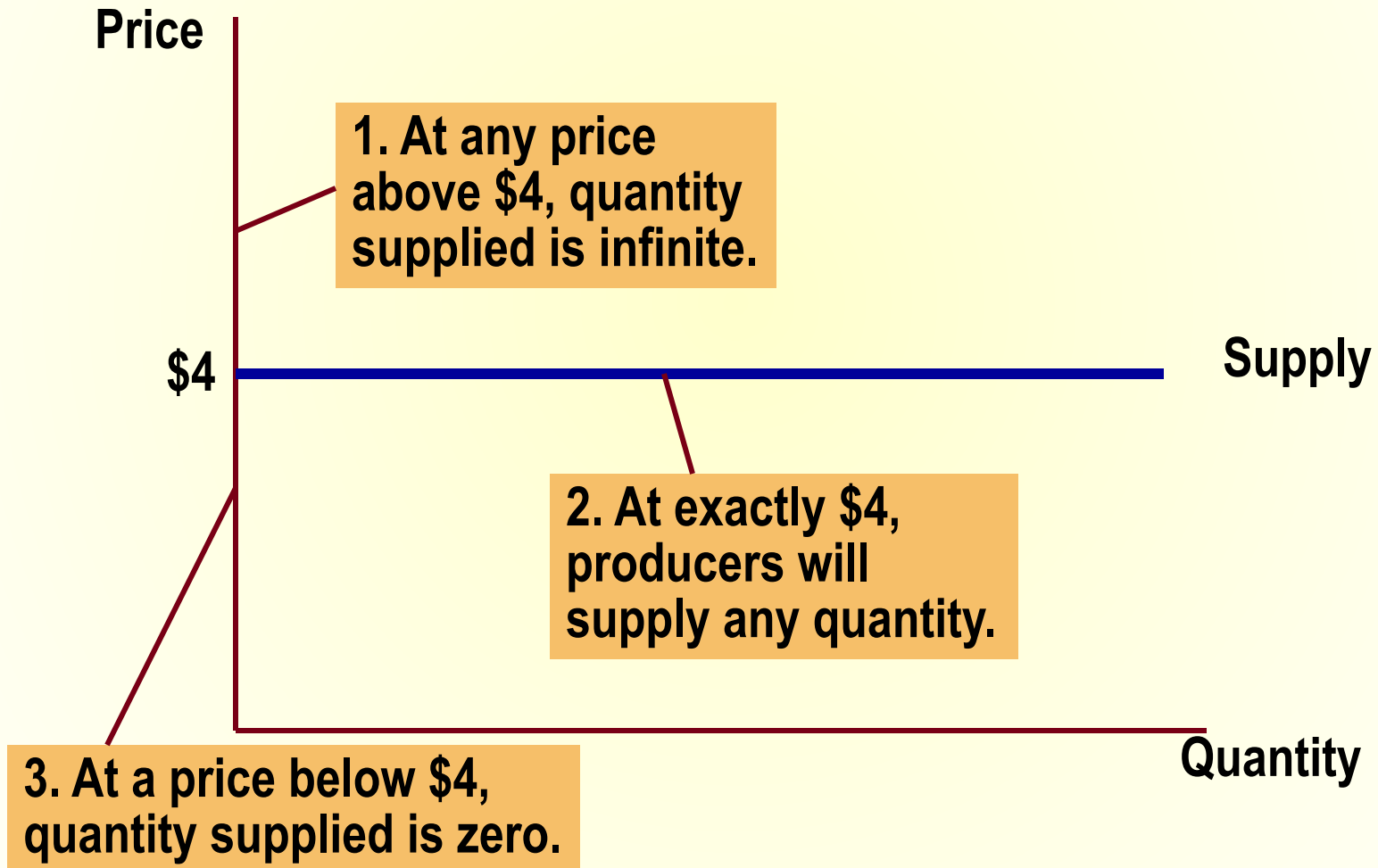
# Elastic Supply

- Elasticity is greater than 1

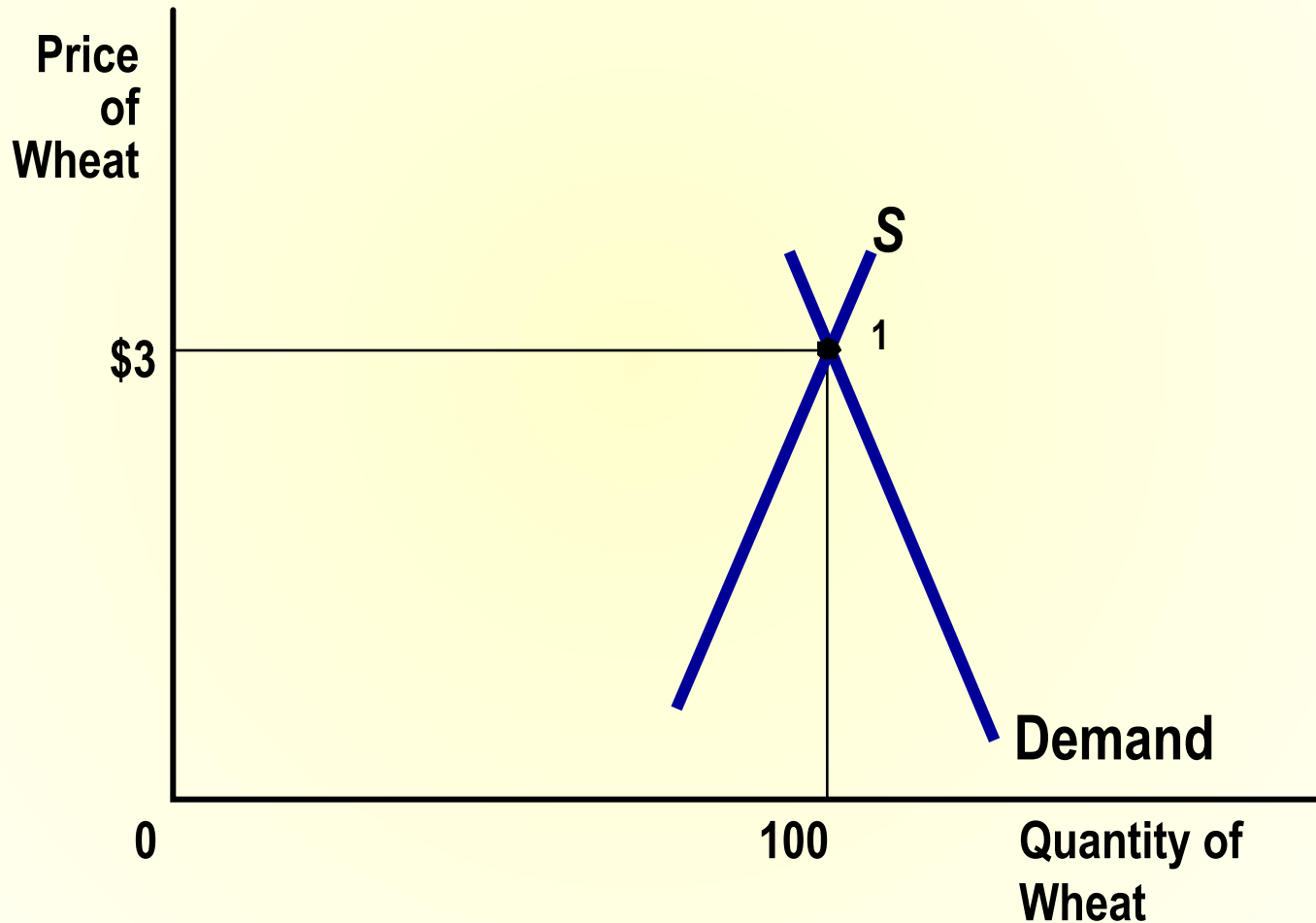


# Perfectly Elastic Supply

- Elasticity equals infinity



# An Increase in Supply in the Market for Wheat



# An Increase in Supply in the Market for Wheat

