



# Elasticity and Its Applications

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# Elasticity . . .

- ... allows us to analyze supply and demand with greater precision.
- ... is a measure of how much buyers and sellers respond to changes in market conditions

# THE ELASTICITY OF DEMAND

- *Price elasticity of demand* is a measure of how much the quantity demanded of a good responds to a change in the price of that good.
- Price elasticity of demand is the percentage change in quantity demanded given a percent change in the price.

# The Price Elasticity of Demand and Its Determinants

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

# The Price Elasticity of Demand and Its Determinants

- Demand tends to be more elastic :
  - the larger the number of close substitutes.
  - if the good is a luxury.
  - the more narrowly defined the market.
  - the longer the time period.

# 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:

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

# The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- 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.

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



# The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

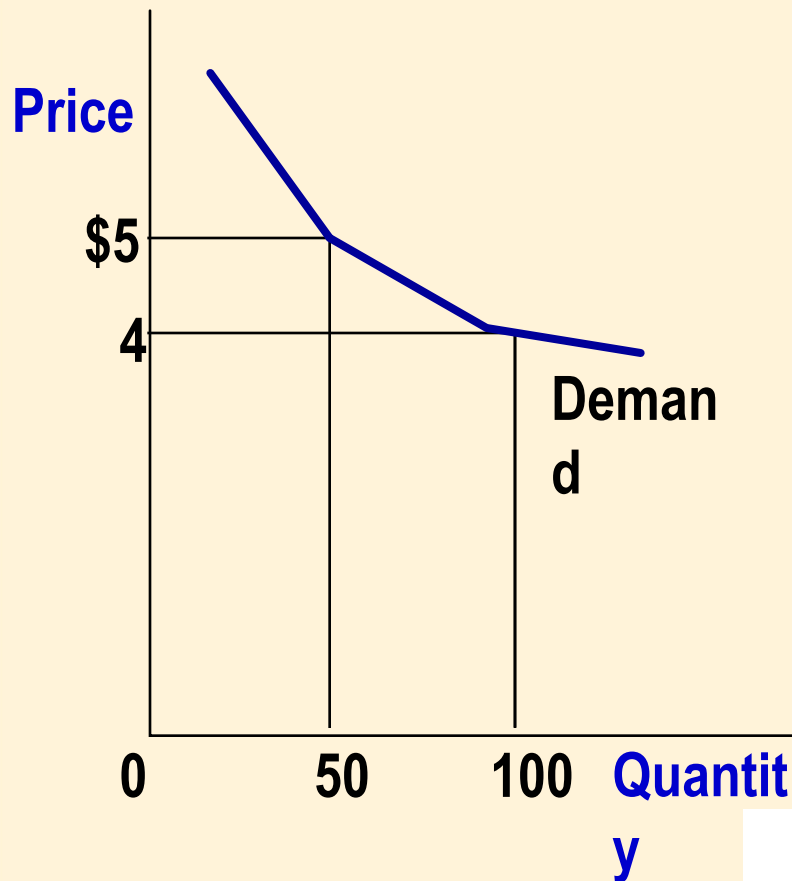
- Example: If the price of an ice cream cone increases from \$2.00 to \$2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand, using the midpoint formula, would be calculated as:

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

# The Variety of Demand Curves

- 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



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

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

**Demand is price elastic**

# The Variety of Demand Curves

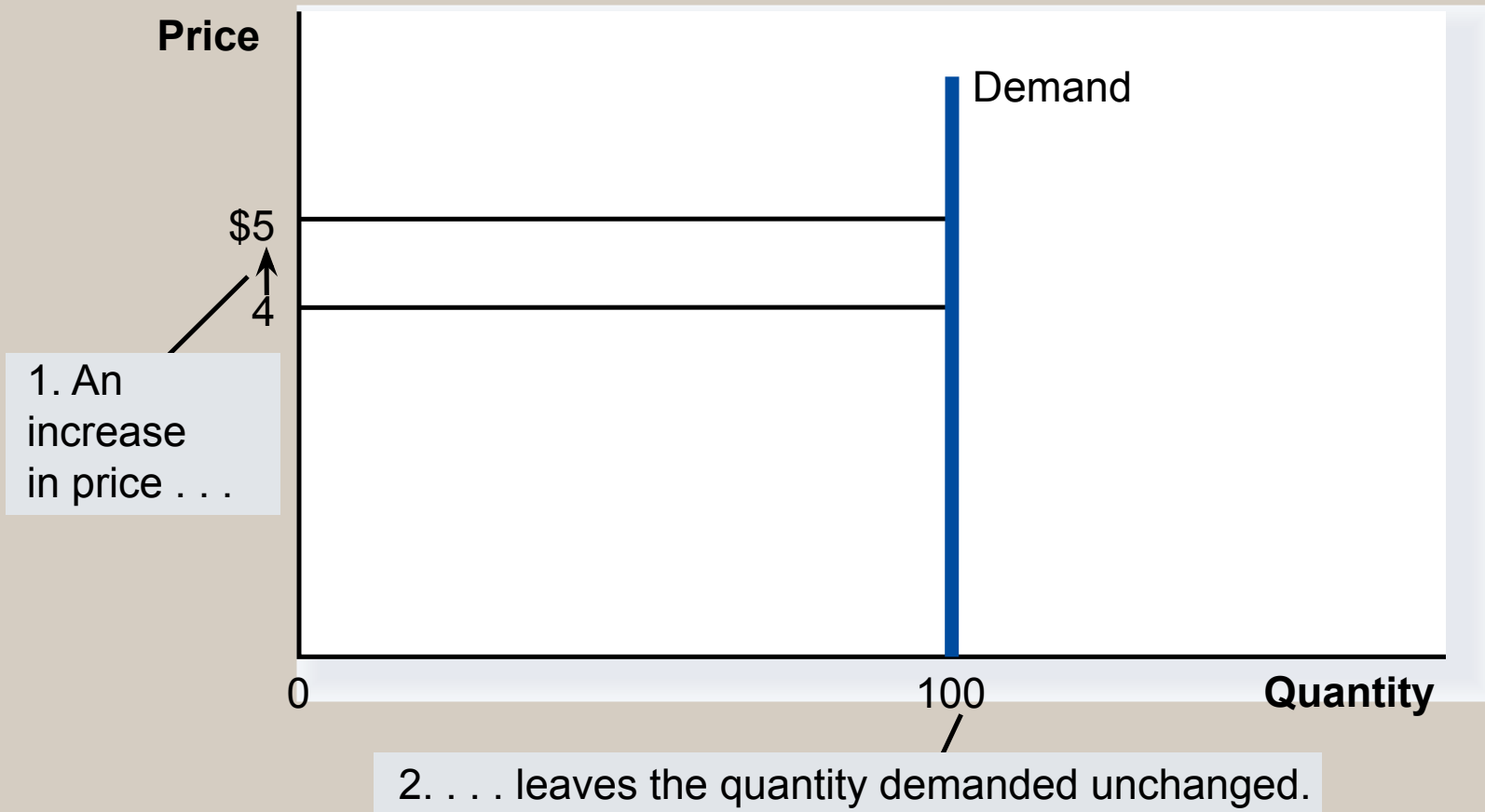
- Perfectly Inelastic
  - Quantity demanded does not respond to price changes.
- Perfectly Elastic
  - Quantity demanded changes infinitely with any change in price.
- Unit Elastic
  - Quantity demanded changes by the same percentage as the price.

# The 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.

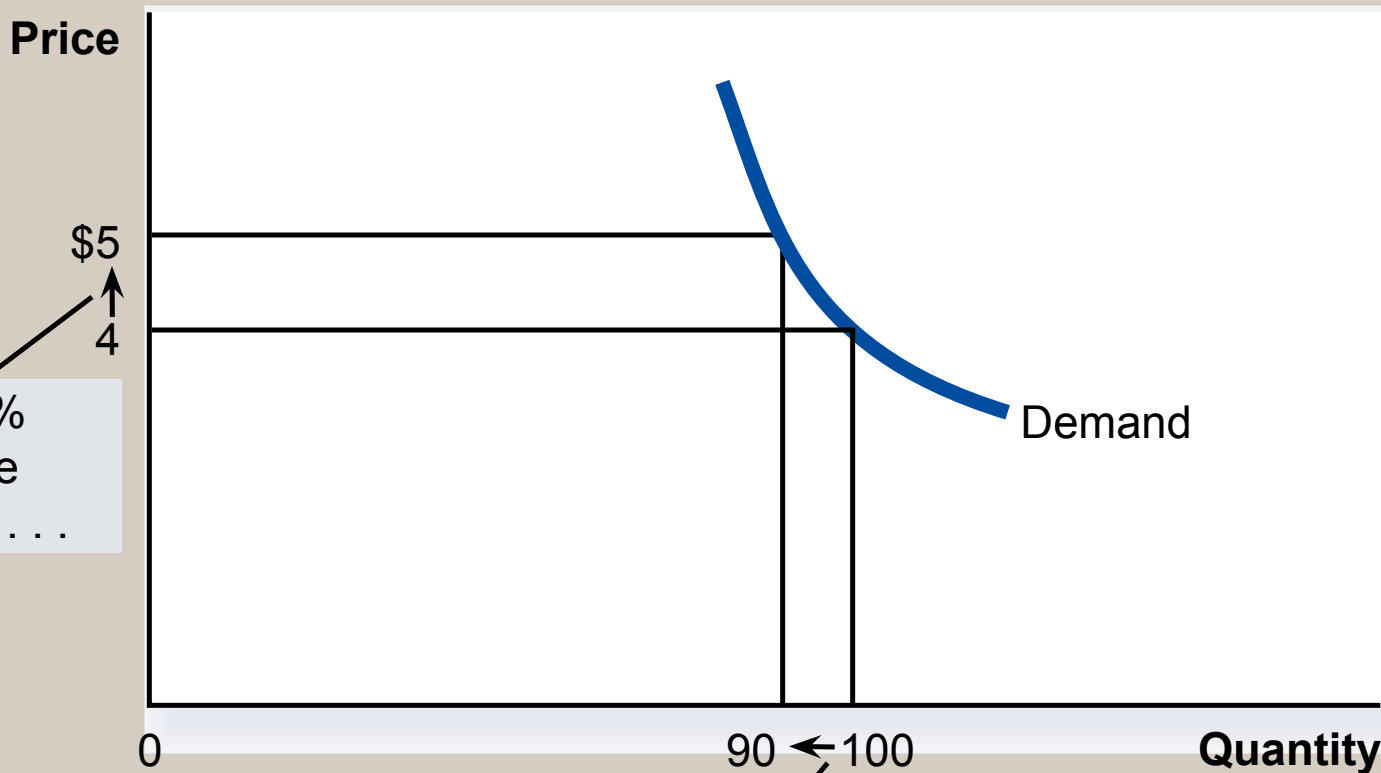
# Figure 1 The Price Elasticity of Demand

(a) Perfectly Inelastic Demand: Elasticity Equals 0



# Figure 1 The Price Elasticity of Demand

## (b) Inelastic Demand: Elasticity Is Less Than 1

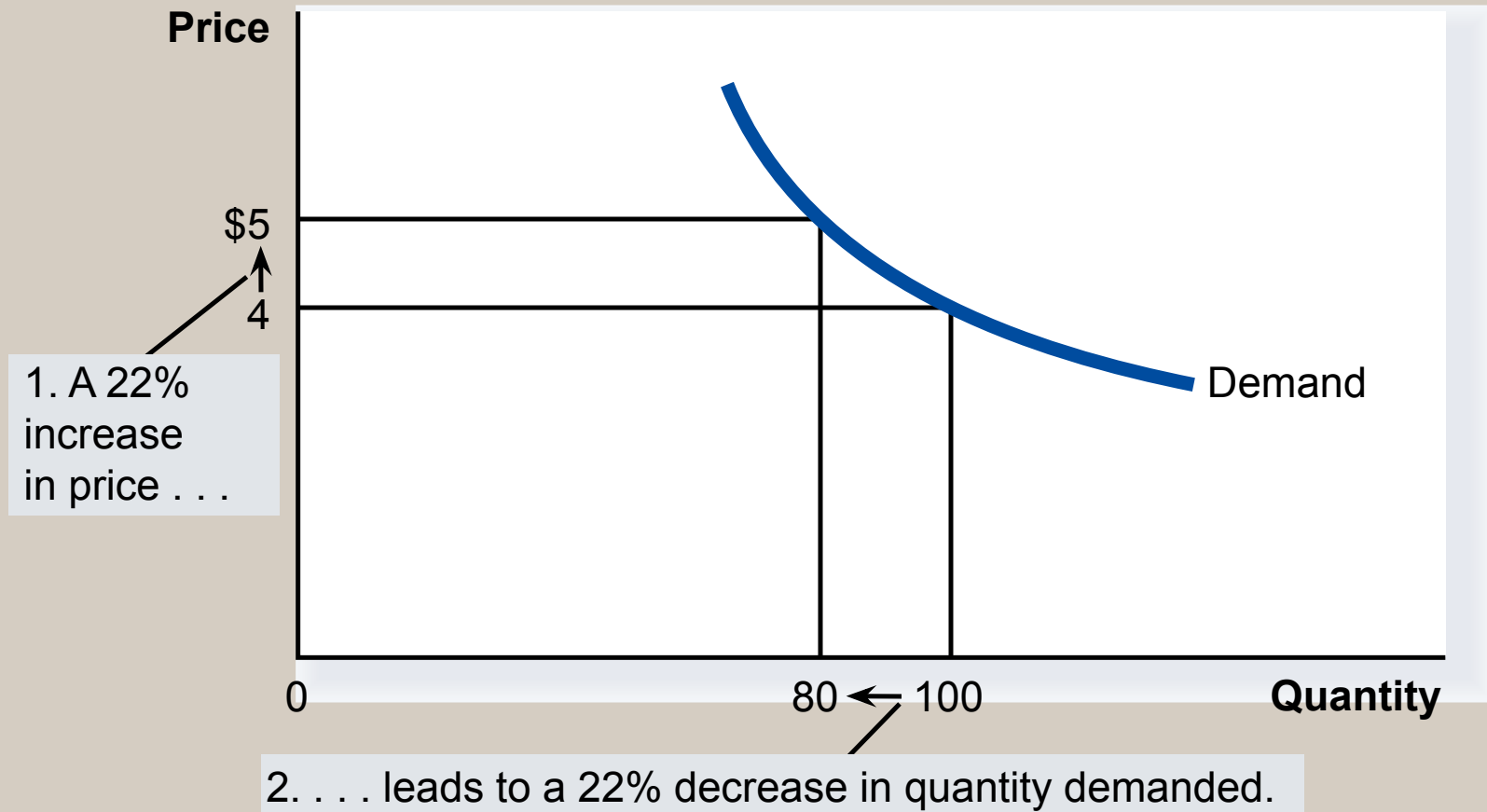


1. A 22% increase in price . . .

2. . . leads to an 11% decrease in quantity demanded.

# Figure 1 The Price Elasticity of Demand

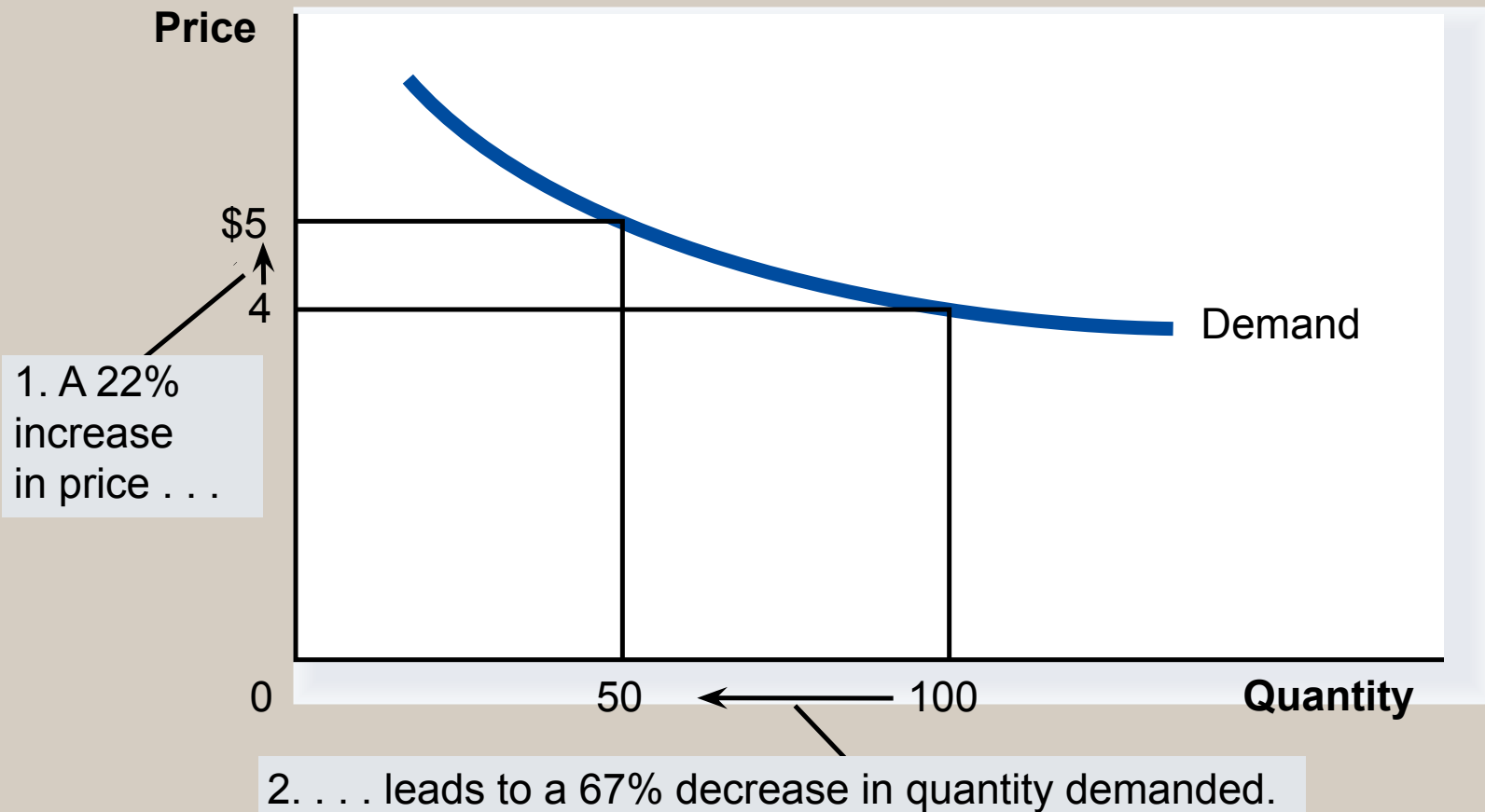
(c) Unit Elastic Demand: Elasticity Equals 1





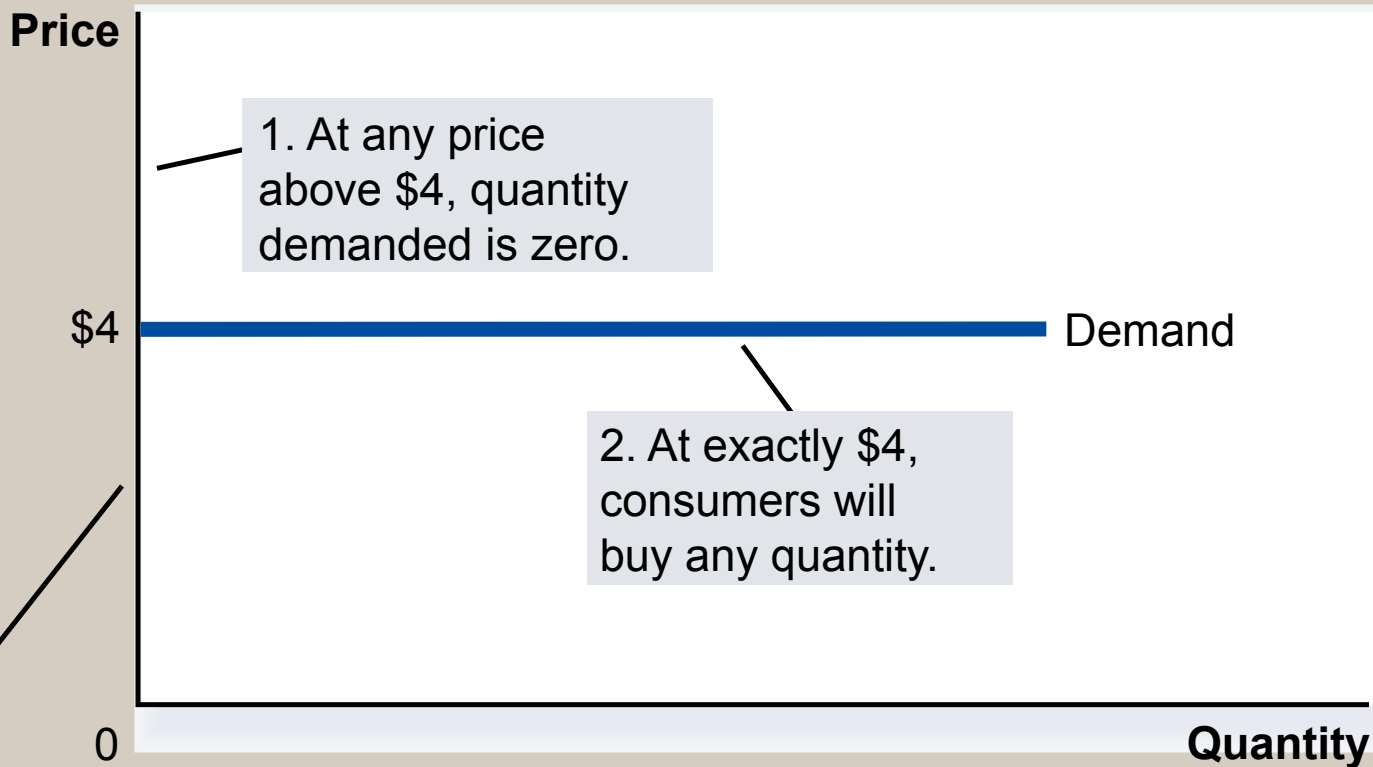
# Figure 1 The Price Elasticity of Demand

(d) Elastic Demand: Elasticity Is Greater Than 1



# Figure 1 The Price Elasticity of Demand

## (e) Perfectly Elastic Demand: Elasticity Equals Infinity



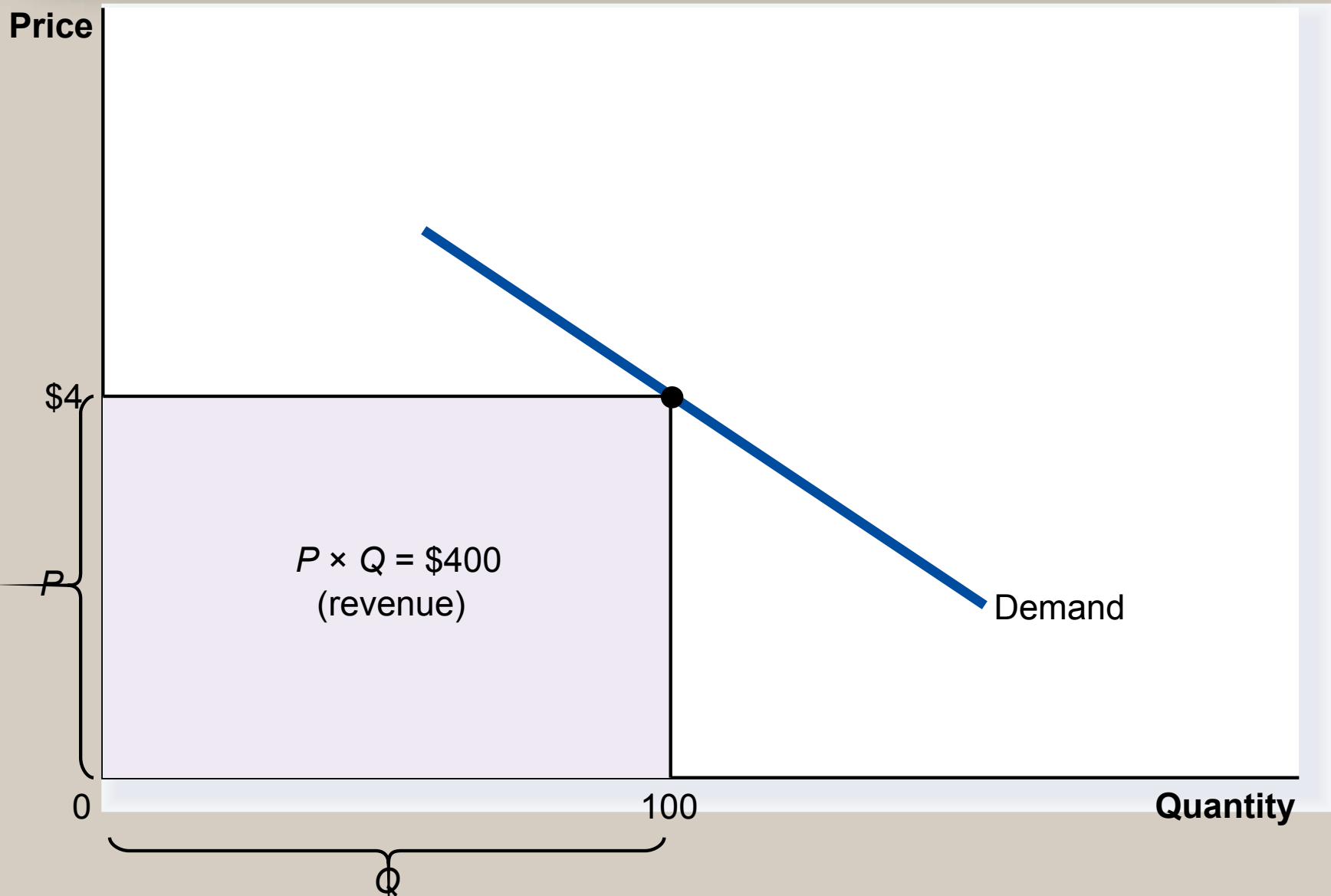
3. At a price below \$4, quantity demanded is infinite.

# Total Revenue and the Price Elasticity of Demand

- *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.

$$TR = P \times Q$$

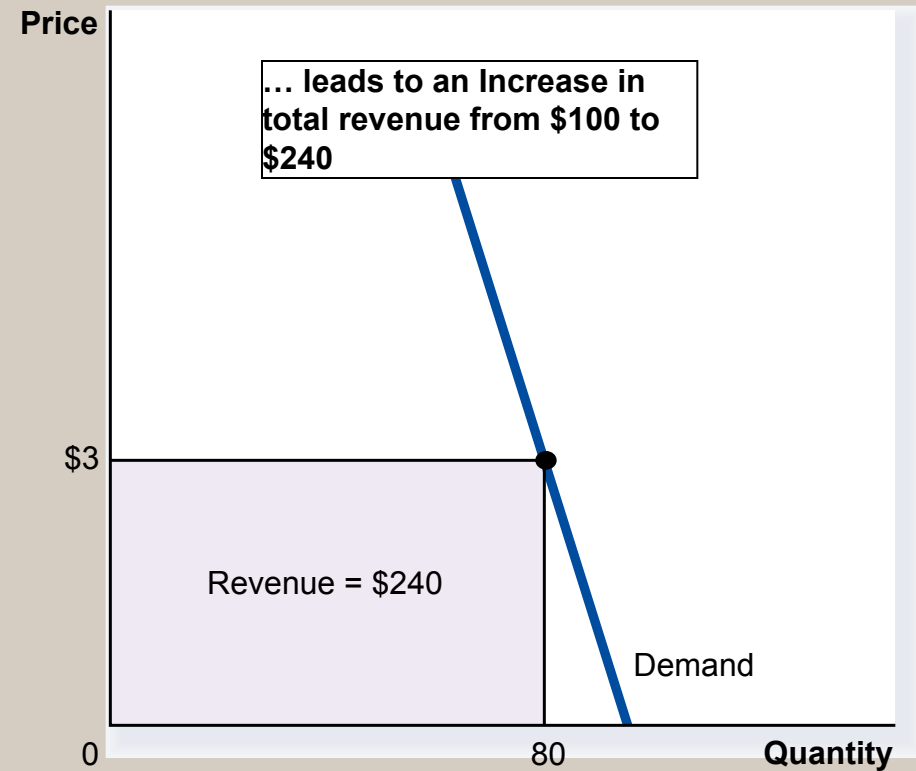
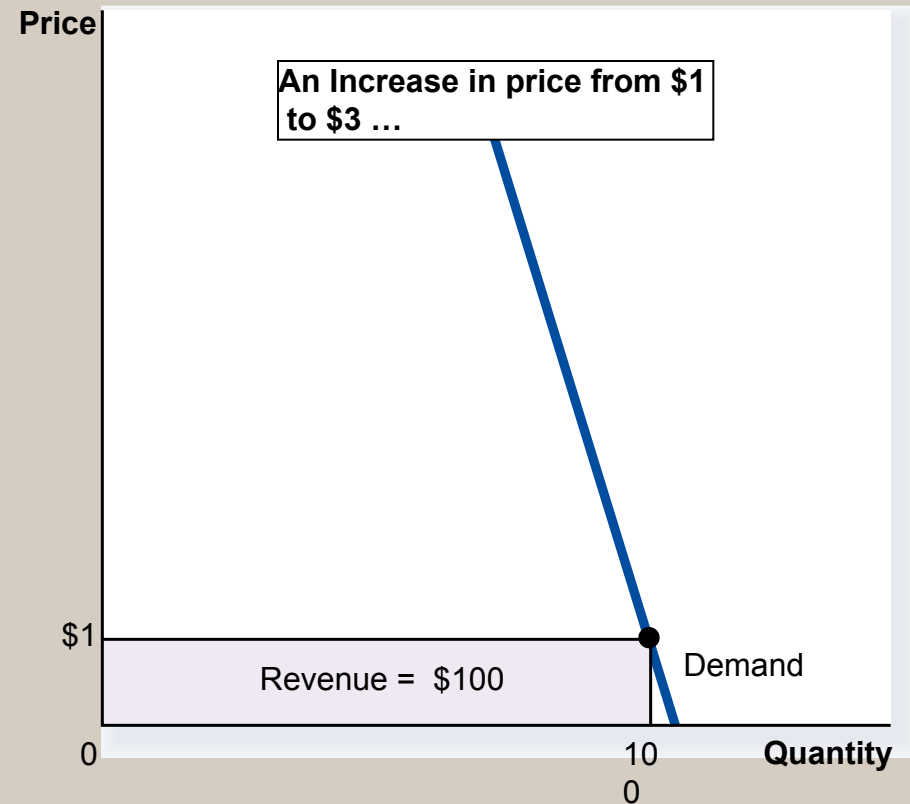
# Figure 2 Total Revenue



# Elasticity and Total Revenue along a Linear Demand Curve

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

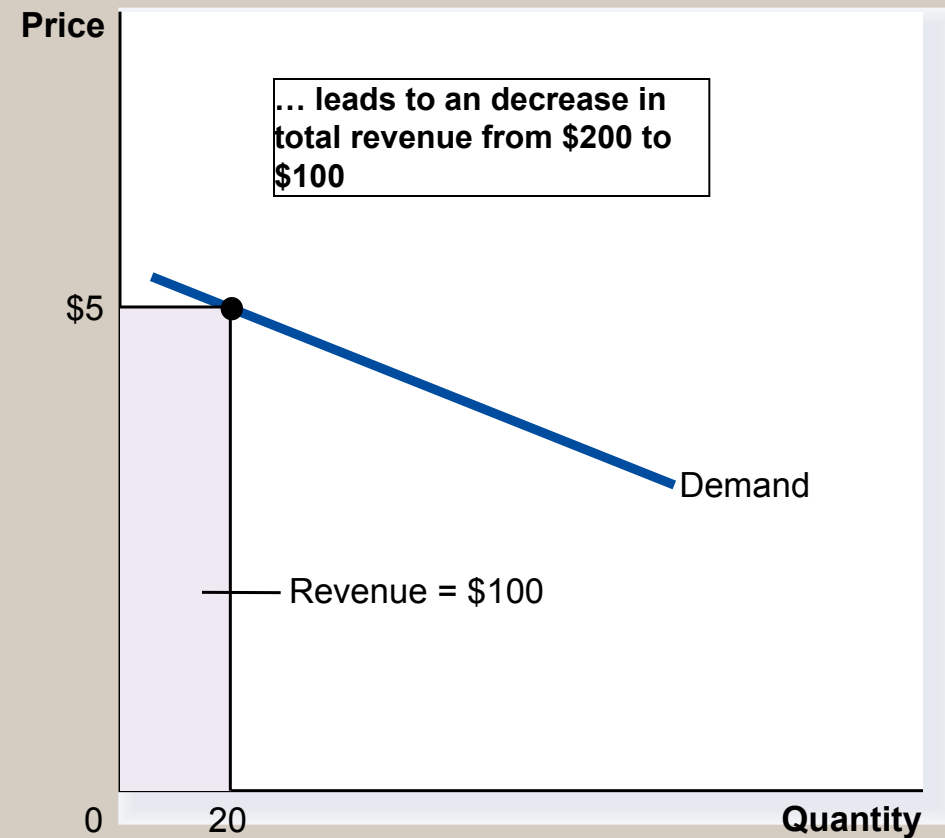
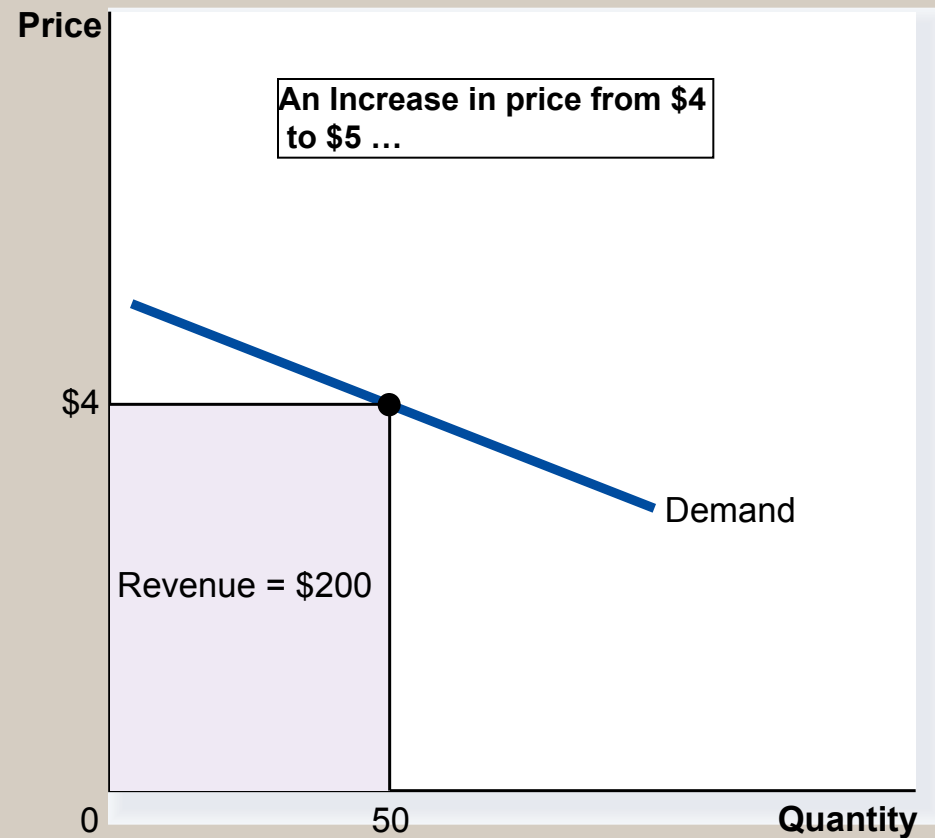
# Figure 3 How Total Revenue Changes When Price Changes: Inelastic Demand



# Elasticity and Total Revenue along a Linear Demand Curve

- 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*.

# Figure 4 How Total Revenue Changes When Price Changes: Elastic Demand





# Elasticity of a Linear Demand Curve

Price	Quantity	Total Revenue (Price × Quantity)	Percent Change in Price	Percent Change in Quantity	Elasticity	Description
\$7	0	\$ 0	15	200	13.0	Elastic
6	2	12	18	67	3.7	Elastic
5	4	20	22	40	1.8	Elastic
4	6	24	29	29	1.0	Unit elastic
3	8	24	40	22	0.6	Inelastic
2	10	20	67	18	0.3	Inelastic
1	12	12	200	15	0.1	Inelastic
0	14	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

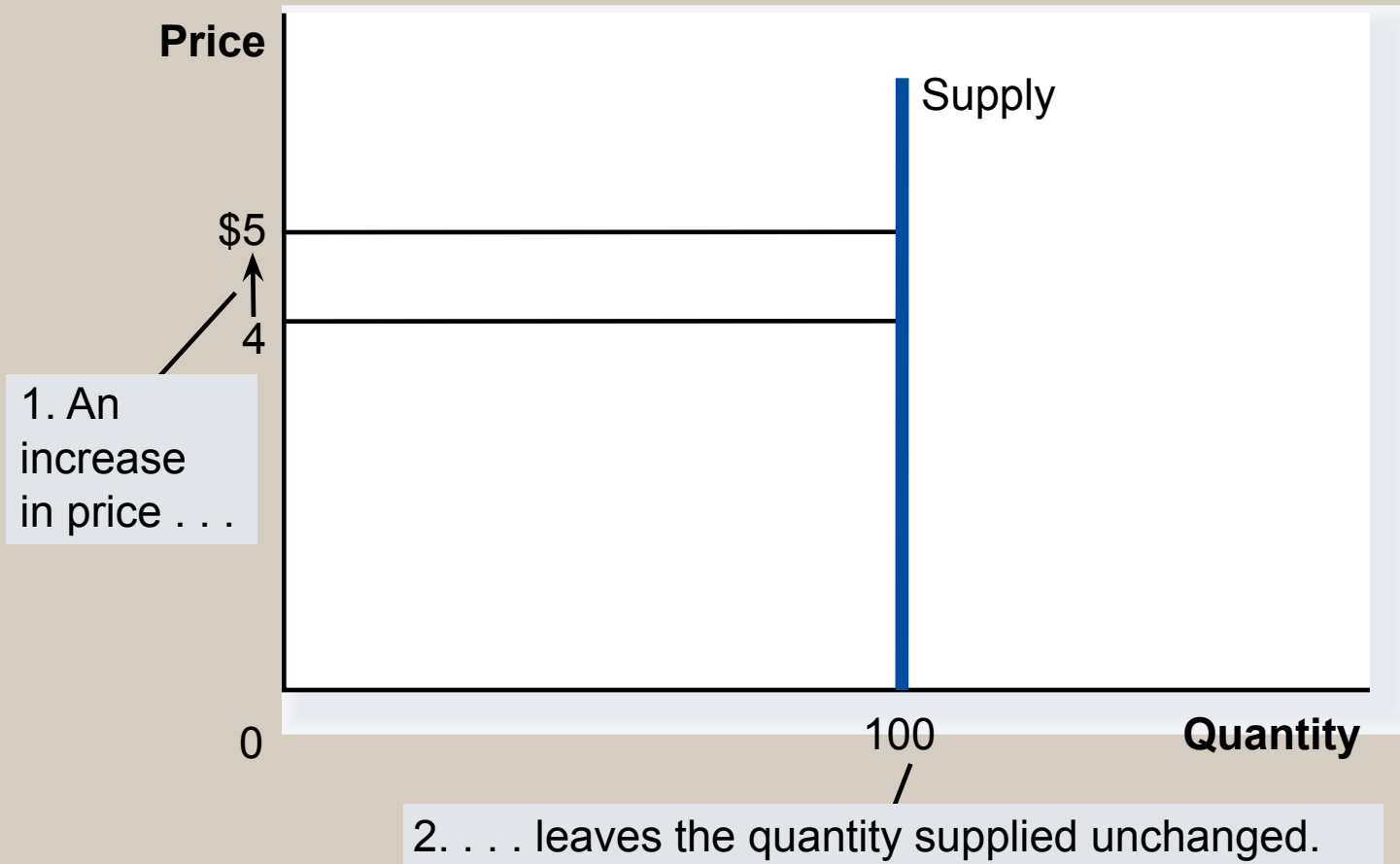
- Goods consumers regard as necessities tend to be income inelastic
  - Examples include food, fuel, clothing, utilities, and medical services.
- Goods consumers regard as luxuries tend to be income elastic.
  - Examples include sports cars, furs, and expensive foods.

# THE ELASTICITY OF SUPPLY

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

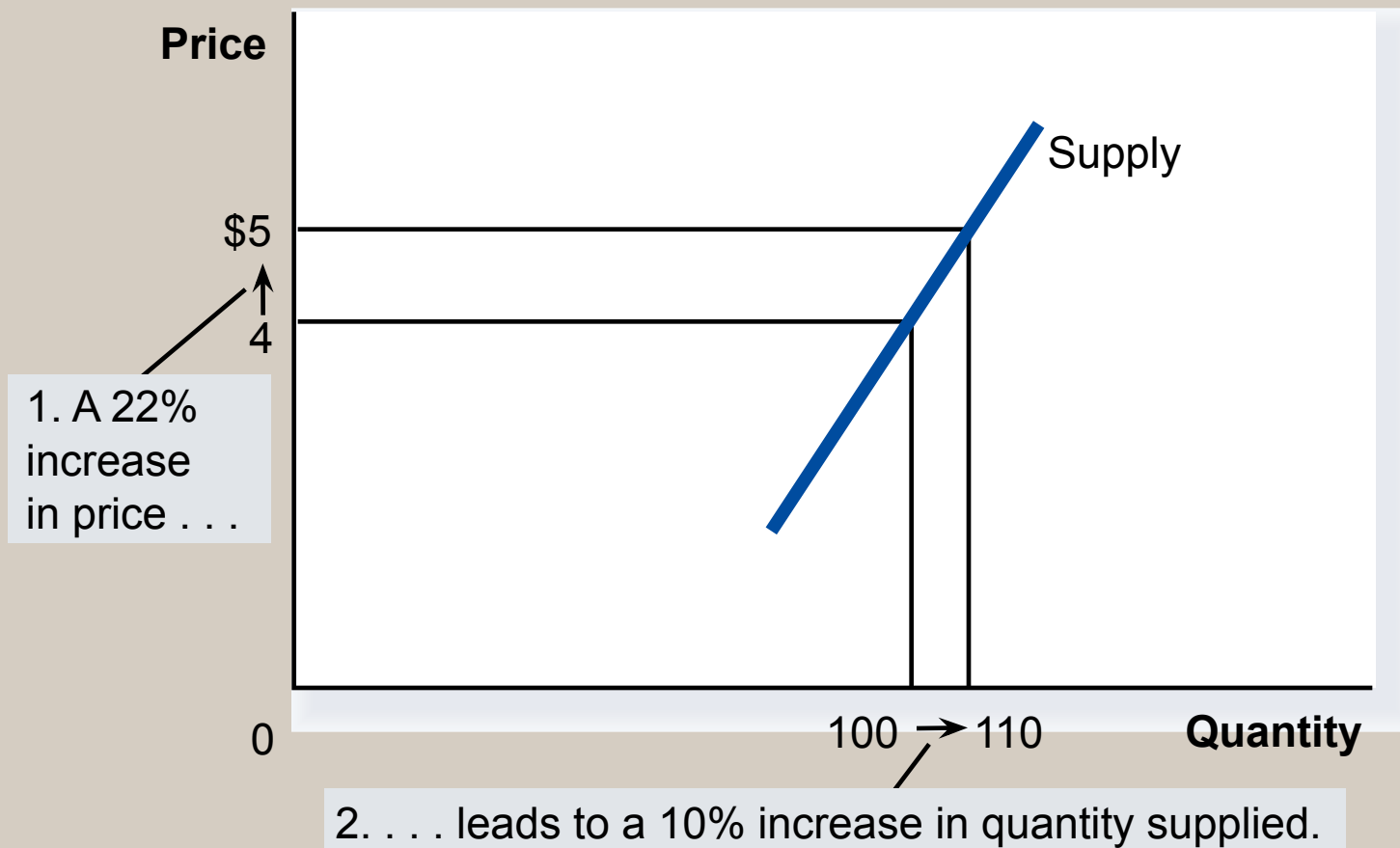
# Figure 6 The Price Elasticity of Supply

(a) Perfectly Inelastic Supply: Elasticity Equals 0



# Figure 6 The Price Elasticity of Supply

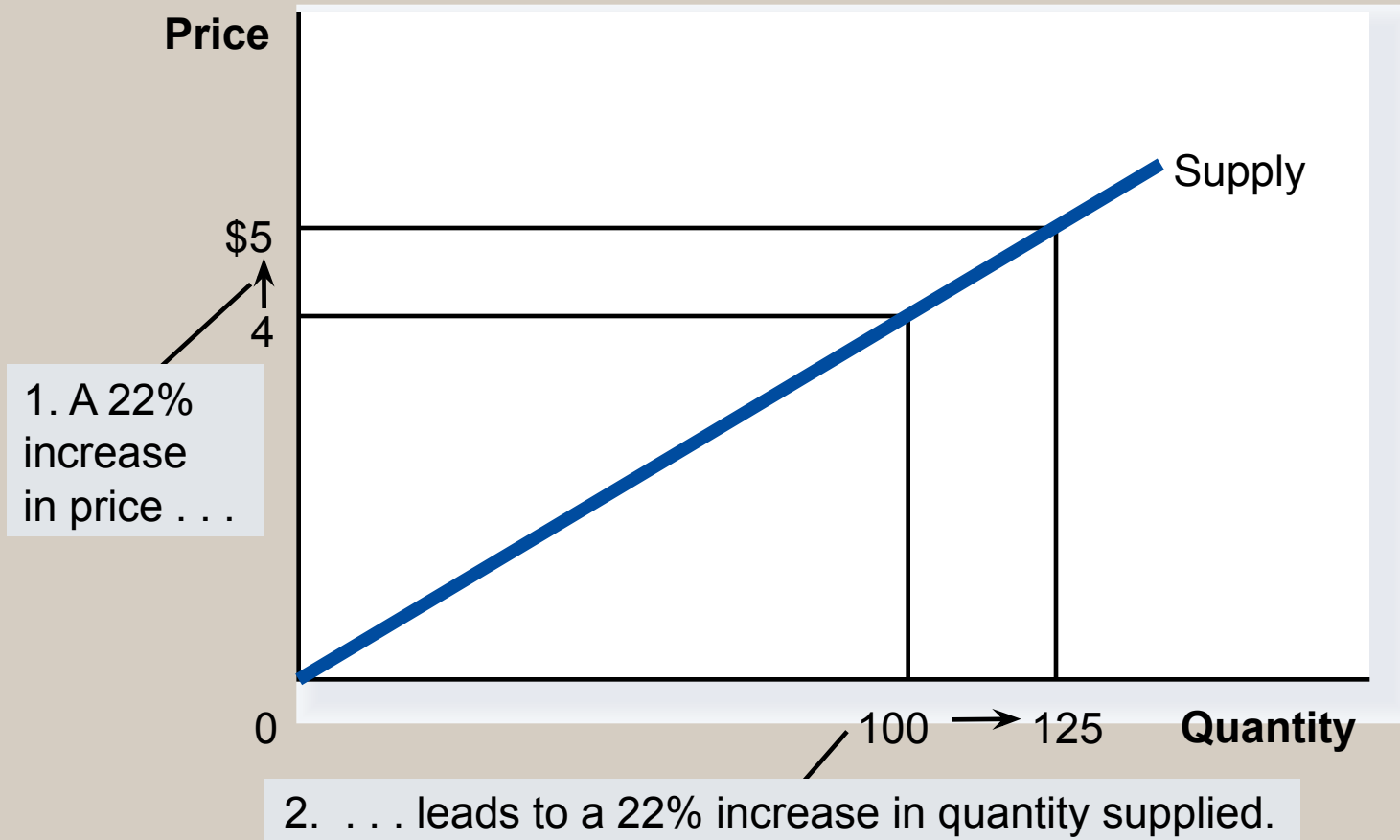
(b) Inelastic Supply: Elasticity Is Less Than 1





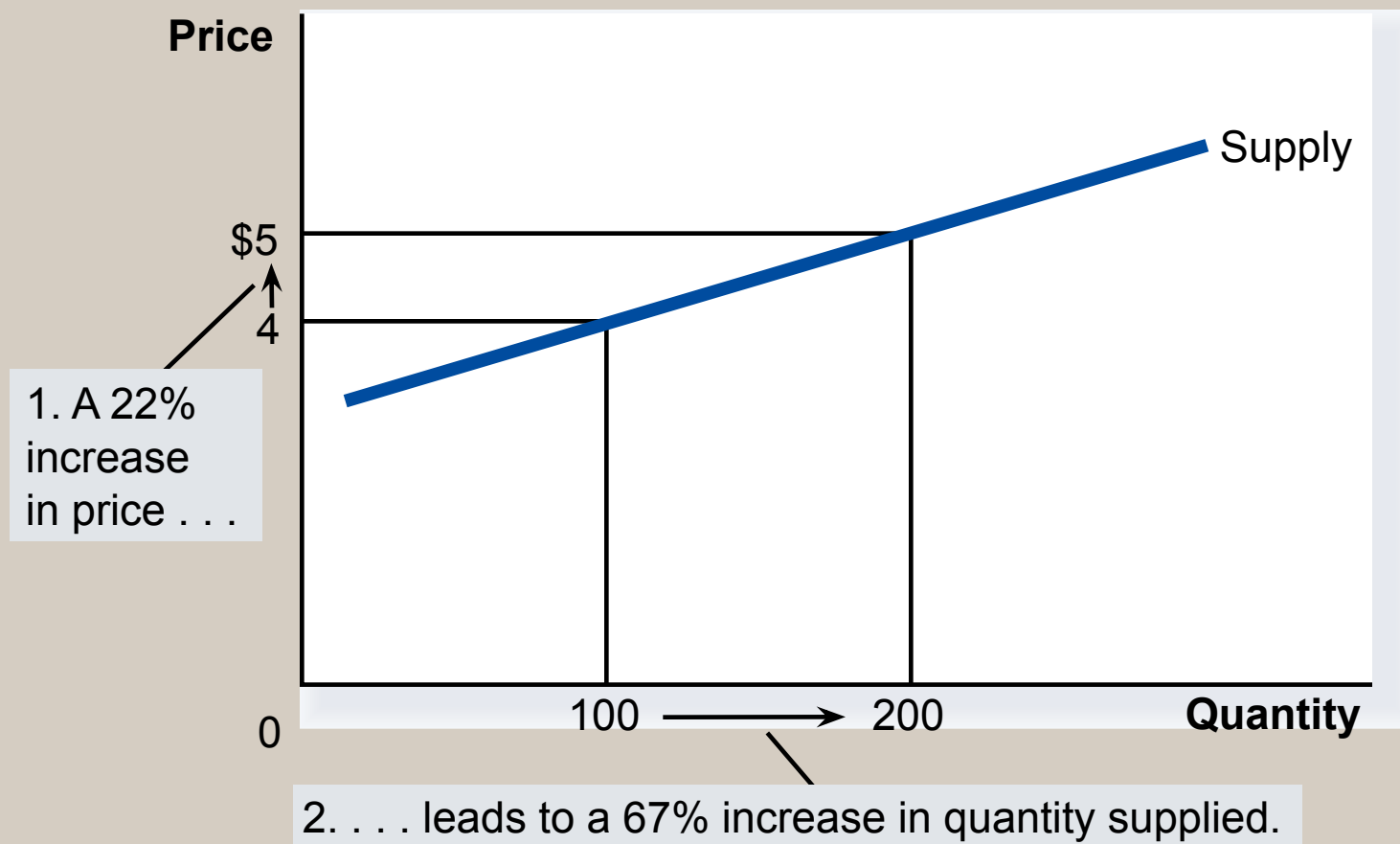
# Figure 6 The Price Elasticity of Supply

(c) Unit Elastic Supply: Elasticity Equals 1



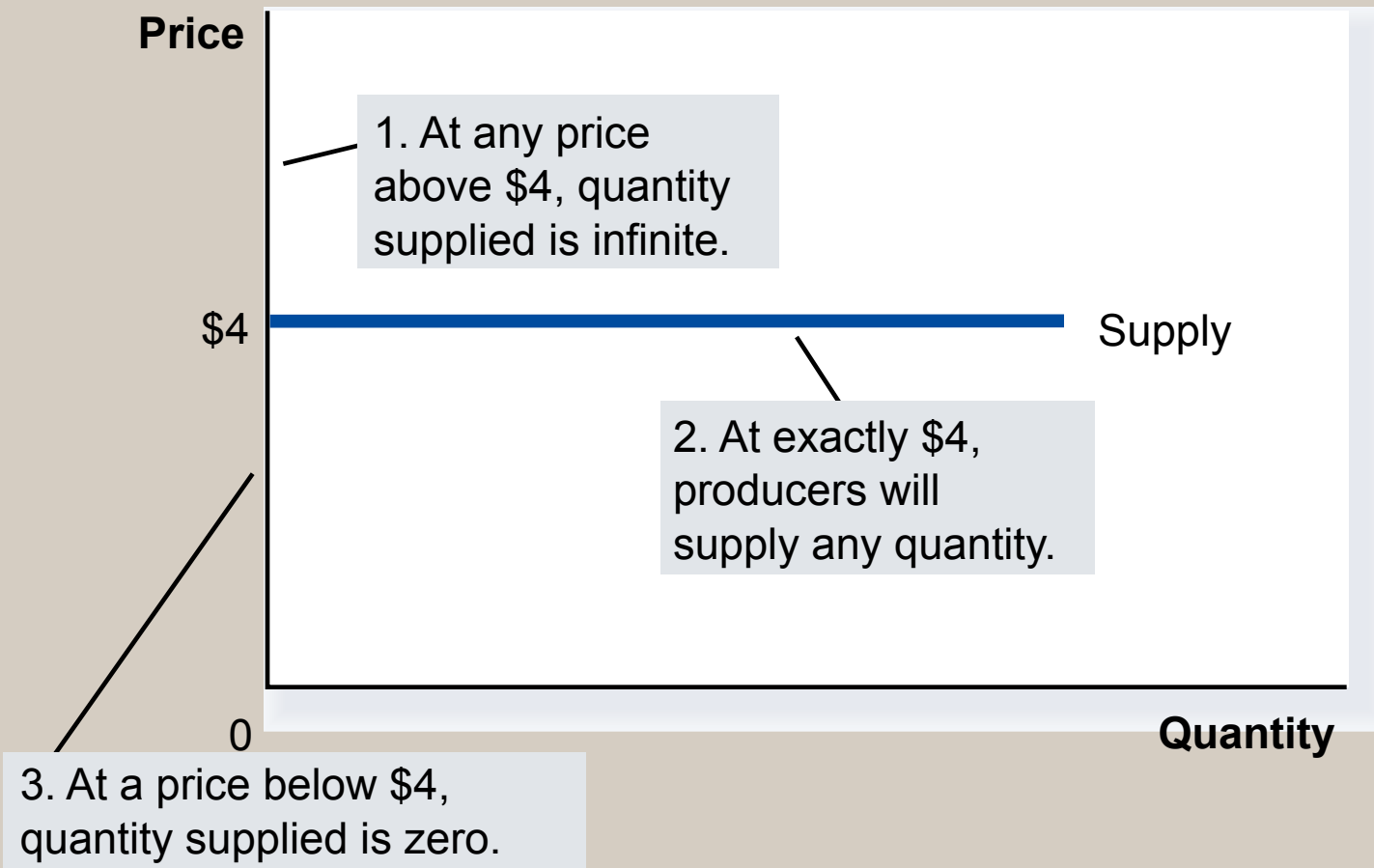
# Figure 6 The Price Elasticity of Supply

(d) Elastic Supply: Elasticity Is Greater Than 1



# Figure 6 The Price Elasticity of Supply

## (e) 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.

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

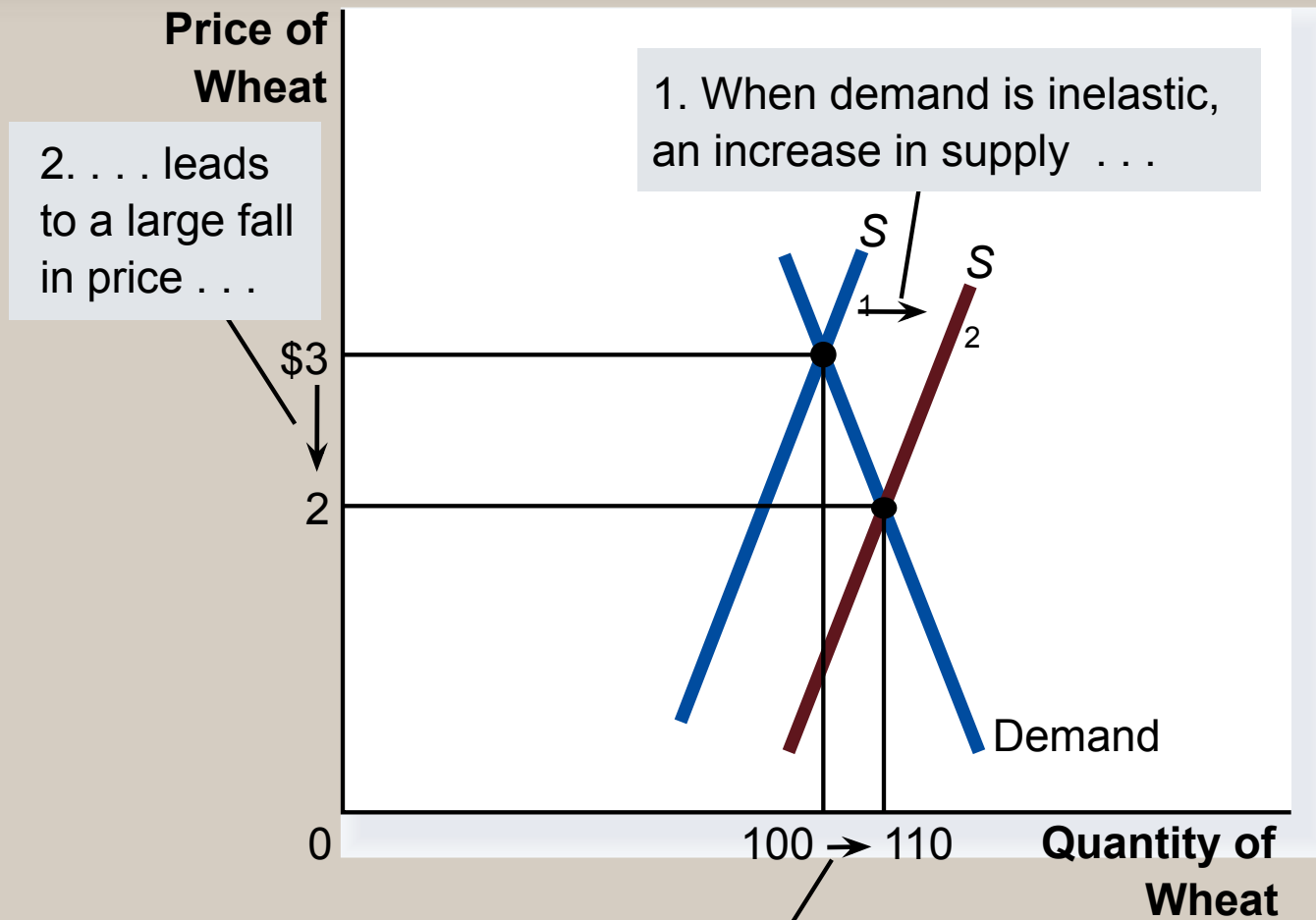
# APPLICATION of ELASTICITY

- 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?

# THE APPLICATION OF SUPPLY, DEMAND, AND 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.

# Figure 8 An Increase in Supply in the Market for Wheat



1. When demand is inelastic, an increase in supply . . .

2. . . . leads to a large fall in price . . .

3. . . . and a proportionately smaller increase in quantity sold. As a result, revenue falls from \$300 to \$220.



# Compute the Price Elasticity of Supply

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

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

Supply is inelastic

# Summary

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- Price elasticity of demand measures how much the quantity demanded responds to changes in the price.
- Price elasticity of demand is calculated as the percentage change in quantity demanded divided by the percentage change in 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

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- The income elasticity of demand measures how much the quantity demanded responds to changes in consumers' income.
- The cross-price elasticity of demand measures how much the quantity demanded of one good responds to the price of another good.
- The price elasticity of supply measures how much the quantity supplied responds to changes in the price. .

# Summary

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- In most markets, supply is more elastic in the long run than in the short run.
- The price elasticity of supply is calculated as the percentage change in quantity supplied divided by the percentage change in price.
- The tools of supply and demand can be applied in many different types of markets.