Chapter 4: Elasticity

Monday, June 28
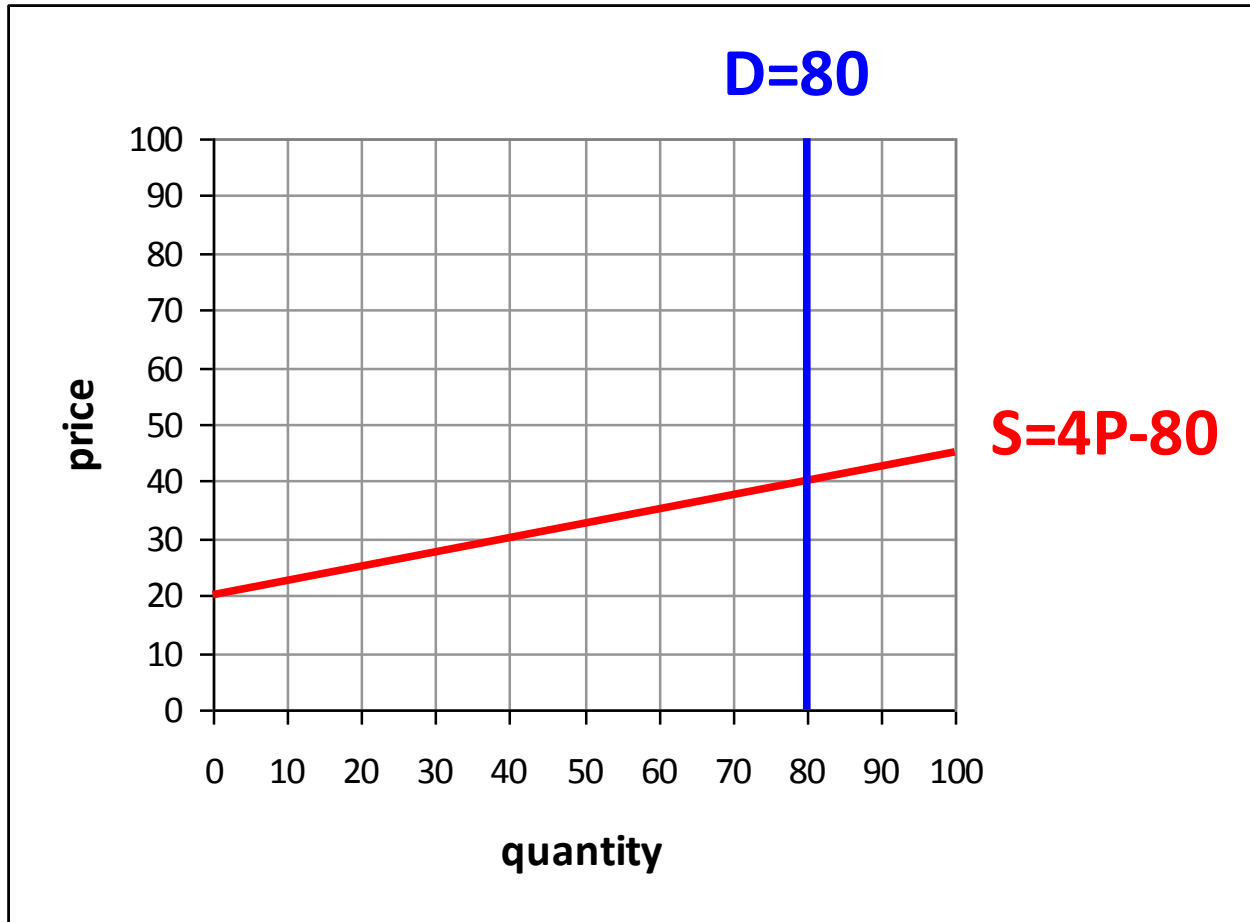
Tuesday, June 29

PERFECTLY INELASTIC SUPPLY

S=60

D=160-2P

price

quantity

Quantity supplied doesn't depend on price at all.

PERFECTLY INELASTIC DEMAND

D=80

S=4P-80

price

quantity

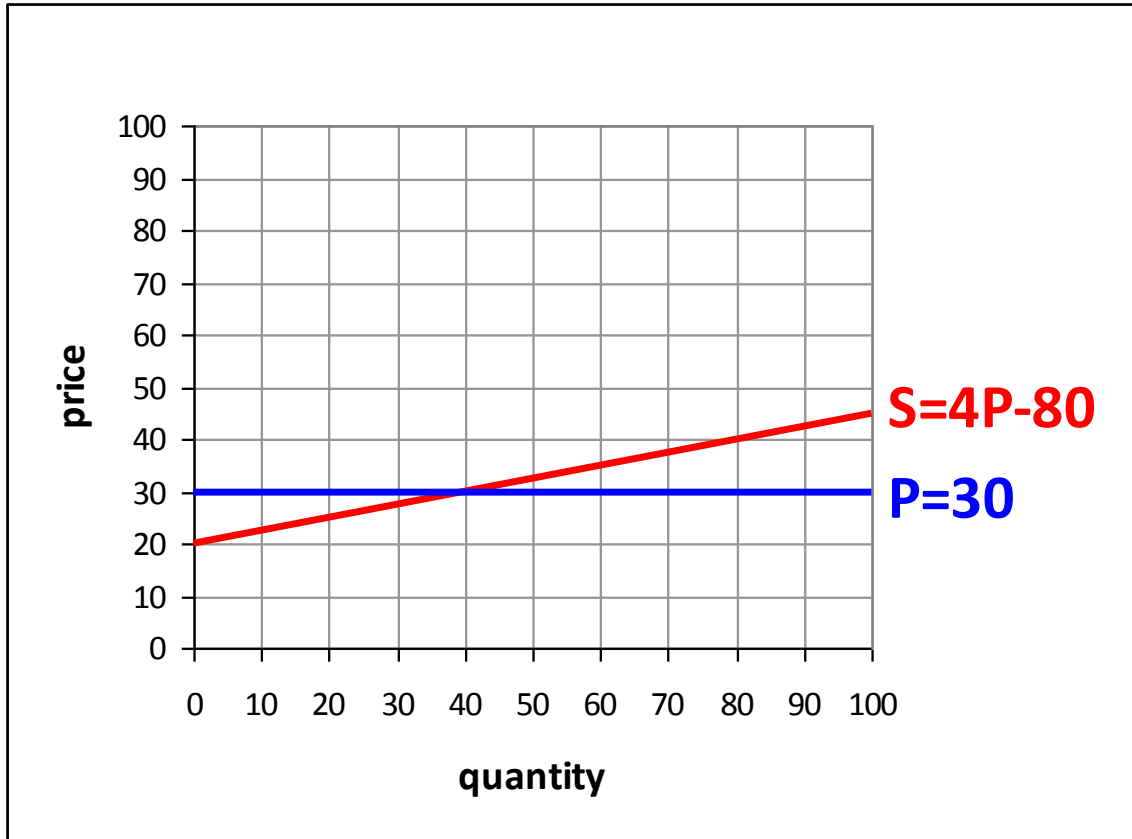**Quantity demanded doesn't depend on price at all.**

PERFECTLY ELASTIC SUPPLY

Below 50, quantity supplied will be zero.

At or above 50, quantity supplied will be enough to cover all demand.

PERFECTLY ELASTIC DEMAND

At or below 30, quantity demanded will be enough to cover all supply.

Above 30, quantity demanded will be zero.

TYPES OF ELASTICITY

Elasticity most commonly refers to

price elasticity of demand, $\dfrac{\%\,\Delta Q_D}{\%\,\Delta P}$

price elasticity of supply, $\dfrac{\%\,\Delta Q_S}{\%\,\Delta P}$

But there are various other types as well, such as

cross-price elasticity of demand, $\dfrac{\%\,\Delta QD_X}{\%\,\Delta P_y}$

income elasticity of demand, $\dfrac{\%\,\Delta Q_D}{\%\,\Delta I}$

PRICE ELASTICITIES

Elasticity most commonly refers to

price elasticity of demand, ε_D, can be written as

$$\frac{\% \, \Delta Q_D}{\% \, \Delta P} \quad , \quad \frac{\Delta Q_D / Q_D}{\Delta P / P} \quad \text{or} \quad \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D}$$

price elasticity of supply, ε_S, can be written as

$$\frac{\% \, \Delta Q_S}{\% \, \Delta P} \quad , \quad \frac{\Delta Q_S / Q_S}{\Delta P / P} \quad \text{or} \quad \frac{\Delta Q_S}{\Delta P} \frac{P}{Q_S}$$

DEMAND ELASTICITY EXAMPLE

Suppose that when price is 40, the quantity demanded is 20, and when price decreases to 35, the quantity demanded increases to 30.

What is the price elasticity of demand at the original price and quantity?

	old	new
P	40	35
Q	20	30

$$\varepsilon = \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D} = \frac{10}{-5} \frac{40}{20} = -4$$

QUESTION 1 (price elasticity of demand, from table)

Suppose that when price is 10, the quantity demanded is 80, and when price decreases to 5, the quantity demanded increases to 90.

What is the price elasticity of demand at the original price and quantity?

	old	new
P	10	5
Q	80	90

A) –4   B) –2   C) –1   D) –.25   E) 0

answer to question 1

Suppose that when price is 10, the quantity demanded is 80, and when price decreases to 5, the quantity demanded increases to 90.

What is the price elasticity of demand at the original price and quantity?

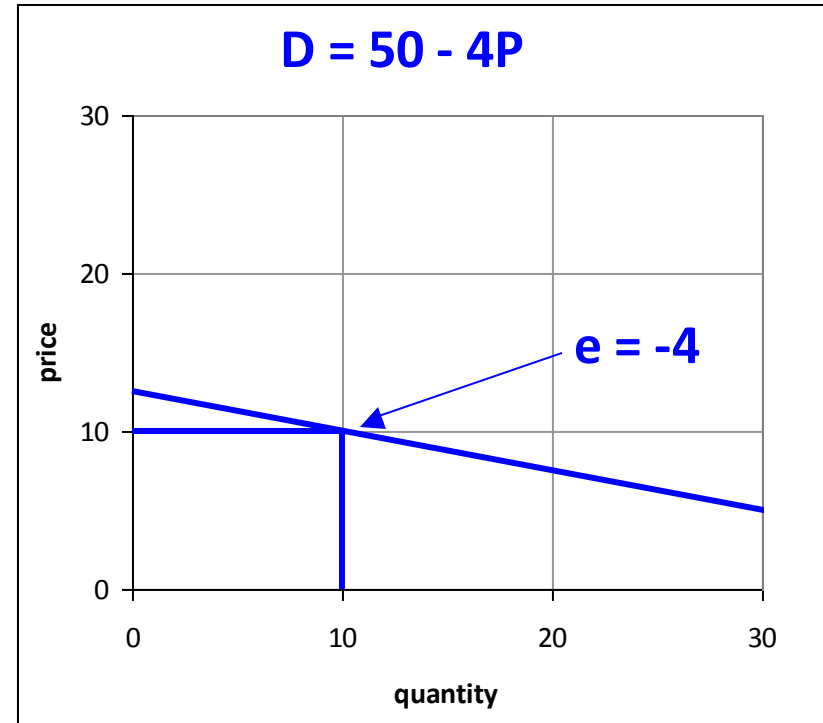|	old	new
P	10	5
Q	80	90

A) −4   B) −2   C) −1   **D) −.25**   E) 0

DEMAND ELASTICITY: INTERPRETATION

Price elasticity of demand gives a unit-free measure of how sensitive demand is to price changes. The demand on the left is relatively inelastic (ε=-.1) at P=10, whereas the demand on the right is relatively elastic (ε=-4). The demand on the right is more sensitive to price changes.

DEMAND ELASTICITY: RANGES

$\varepsilon = -\infty$

$\varepsilon = -1$

$\varepsilon = 0$

elastic   inelastic

perfectly elastic   perfectly inelastic
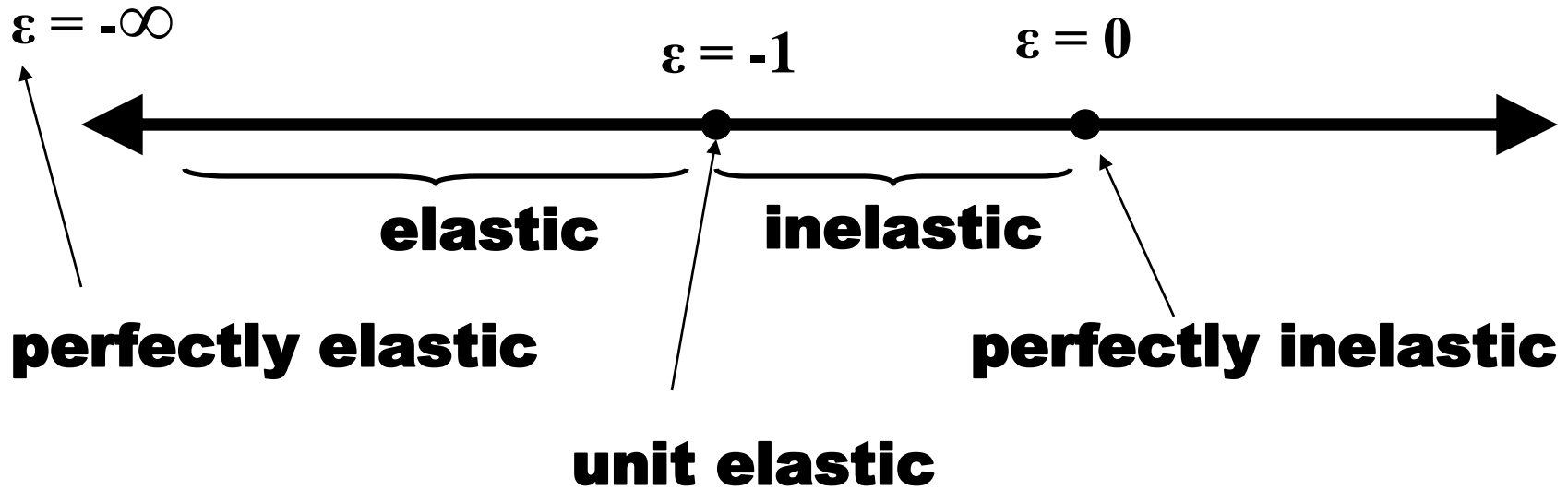
unit elastic

When demand elasticity is more negative than –1, demand is "elastic".

When it is less negative than –1, demand is "inelastic".

When it is equal to –1, demand is "unit elastic".

QUESTION 2 (price elasticity of demand, from table)

Suppose that when price is 25, the quantity demanded is 50, and when price decreases to 20, the quantity demanded increases to 60.

What is the price elasticity of demand at the original price and quantity?

	old	new
P	25	20
Q	50	60

A) –4   B) –2   C) –1   D) –.25   E) 0

answer to question 2

Suppose that when price is 25, the quantity demanded is 50, and when price decreases to 20, the quantity demanded increases to 60.

What is the price elasticity of demand at the original price and quantity?

	old	new
P	25	20
Q	50	60

A) –4   B) –2   C) –1   D) –.25   E) 0

FINDING ELASTICITY FROM THE DEMAND FUNCTION

Suppose that the demand function is
Q_D = 100 – 2P. When the price is 30, what is the price elasticity of demand?

First, find Q_D... P=30 → Q_D = 100 – 2(30) = 40.

Next, find $\Delta Q_D / \Delta P$... Either take the derivative, choose an arbitrary price change, or just observe the coefficient in front of P (in any linear demand function). In this case, $\Delta Q_D / \Delta P$ = 2.

$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D} \qquad \varepsilon_D = (-2)\frac{30}{40} = -1.5$$

QUESTION 3 (price elasticity of demand, from function)

Suppose that the demand function is
$Q_D = 100 - 2P$. When the price is 40, what is the
price elasticity of demand?

A) -10　　B) -8　　C) -4　　D) -2　　E) -1

Suppose that the demand function is Q_D = 100 − 2P. When the price is 40, what is the price elasticity of demand?

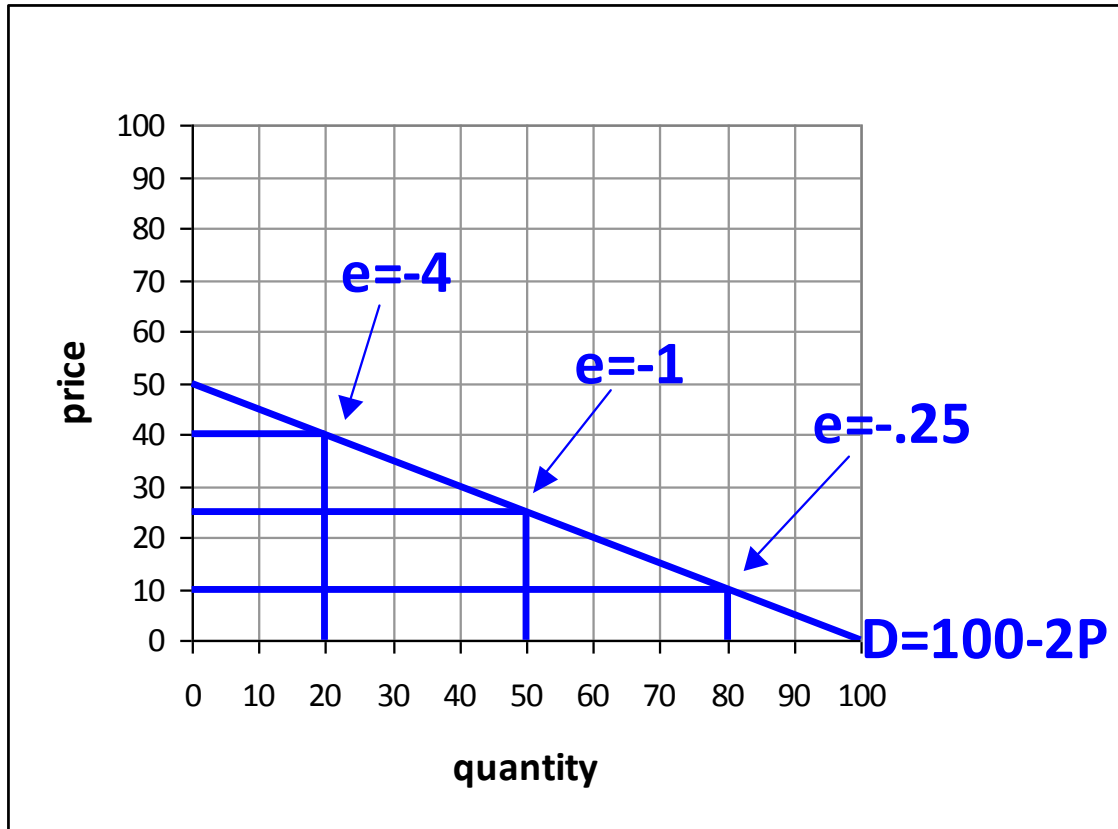$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D} = (-2)\frac{40}{20} = -4$$

A) -10   B) -8   C) -4   D) -2   E) -1

ELASTICITY ON A LINEAR DEMAND CURVE

Notice that even when the slope of a demand curve stays constant, the elasticity of demand will be different at each point along the curve.
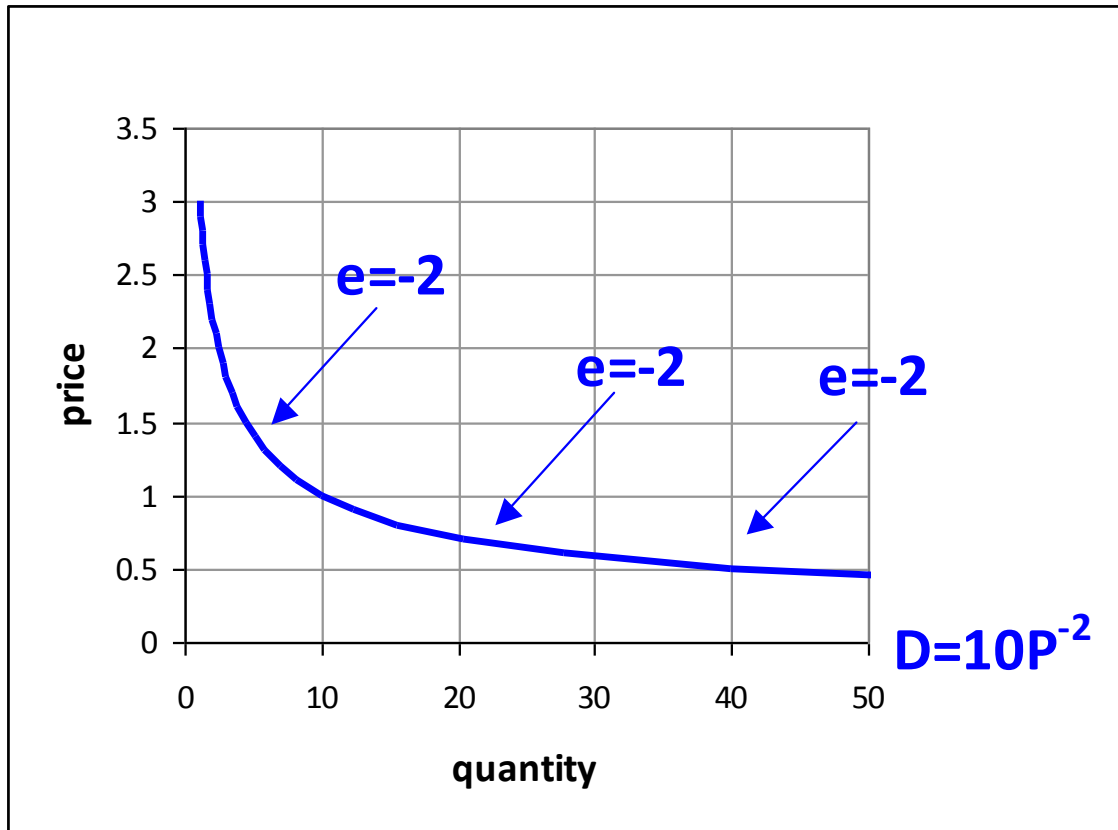
ELASTICITY ON A LINEAR DEMAND CURVE

An alternative measure of elasticity, starting from the graph of the demand curve, is

$$\varepsilon = \frac{\Delta Q_D}{\Delta P} \frac{P}{Q_D} = \frac{1}{\text{slope}} \frac{P}{Q}$$

(CONSTANT ELASTICITY DEMAND)

If you wanted a demand curve to have exactly the same elasticity everywhere, then it would actually be curved, and it would have to be of a special form, $D = AP^{-\varepsilon}$. But <u>don't worry about this.</u>

ELASTICITY OF DEMAND

A positive price elasticity of demand would correspond to an upward-sloping demand curve. This would be weird, so we won't talk about it.

An elasticity of zero would correspond to a perfectly inelastic demand curve. That is, demand is fixed, independent of the price.

Usually, price elasticity of demand is negative. This is so much the norm that sometimes people drop the minus sign (i.e., take the absolute value), simply for convenience.

DETERMINANTS OF DEMAND ELASTICITY

What kinds of things would cause demand for a good to be elastic?

If there are close substitutes available

If we are measuring the effect in the long run rather than the short run

If the good accounts for only a small part of people's budget share

What kinds of things would cause demand for a good to be inelastic?

The opposite of any of these.

Suppose that the demand function is
Q_D = 60 – P. When the price is 20, what is the price elasticity of demand?

A) -1/2   **B) -1/4**   **C) -4**   **D) -2**   **E) -1**

Suppose that the demand function is
Q_D = 60 – P. When the price is 20, what is the price elasticity of demand?

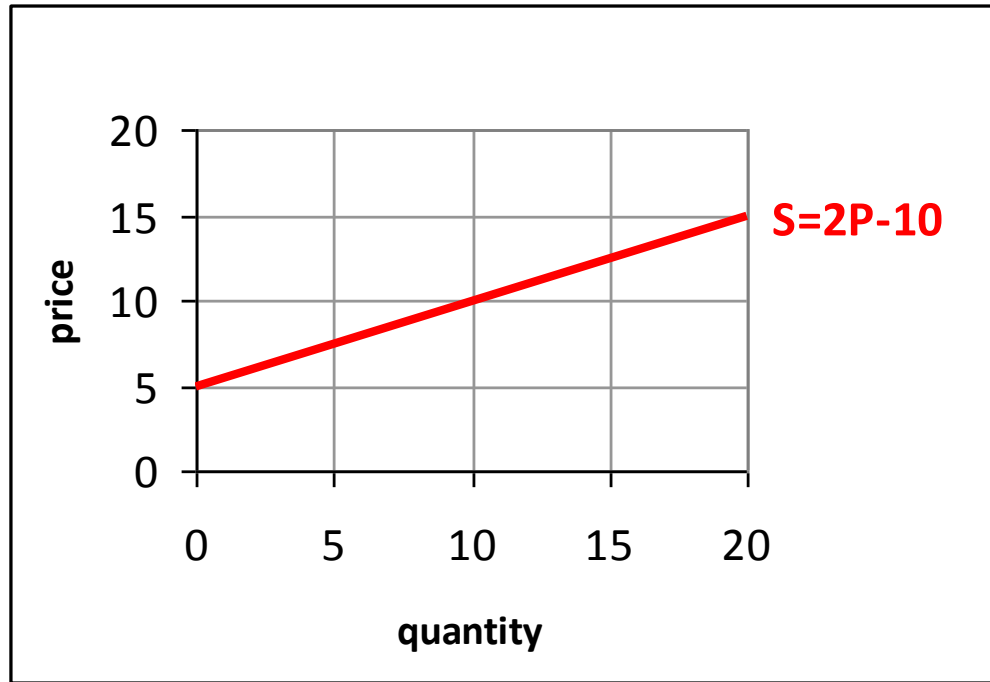$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P}\frac{P}{Q_D} = (-1)\frac{20}{40} = -1/2$$

A) -1/2   **B) -1/4**   **C) -4**   **D) -2**   **E) -1**

QUESTION 5 (price elasticity of supply)

S=2P-10

In the graph above, S = 2P − 10. What is the price elasticity of supply when P = $10?
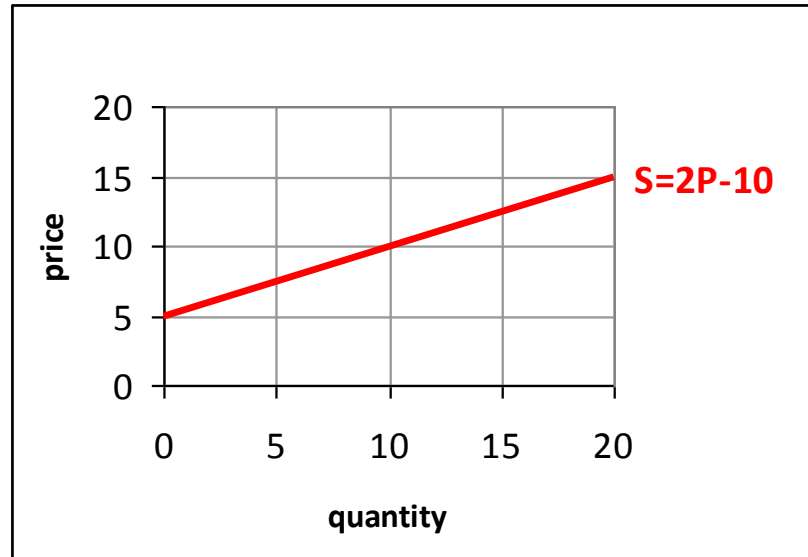
A) −2   B) −1   C) 1/2   D) 1   E) 2

answer to question 5

$$\varepsilon_s = \frac{\Delta Q_s}{\Delta P}\frac{P}{Q_s} = (2)\left(\frac{10}{10}\right) = 2$$

In the graph above, S = 2P – 10. What is the price elasticity of supply when P = $10?
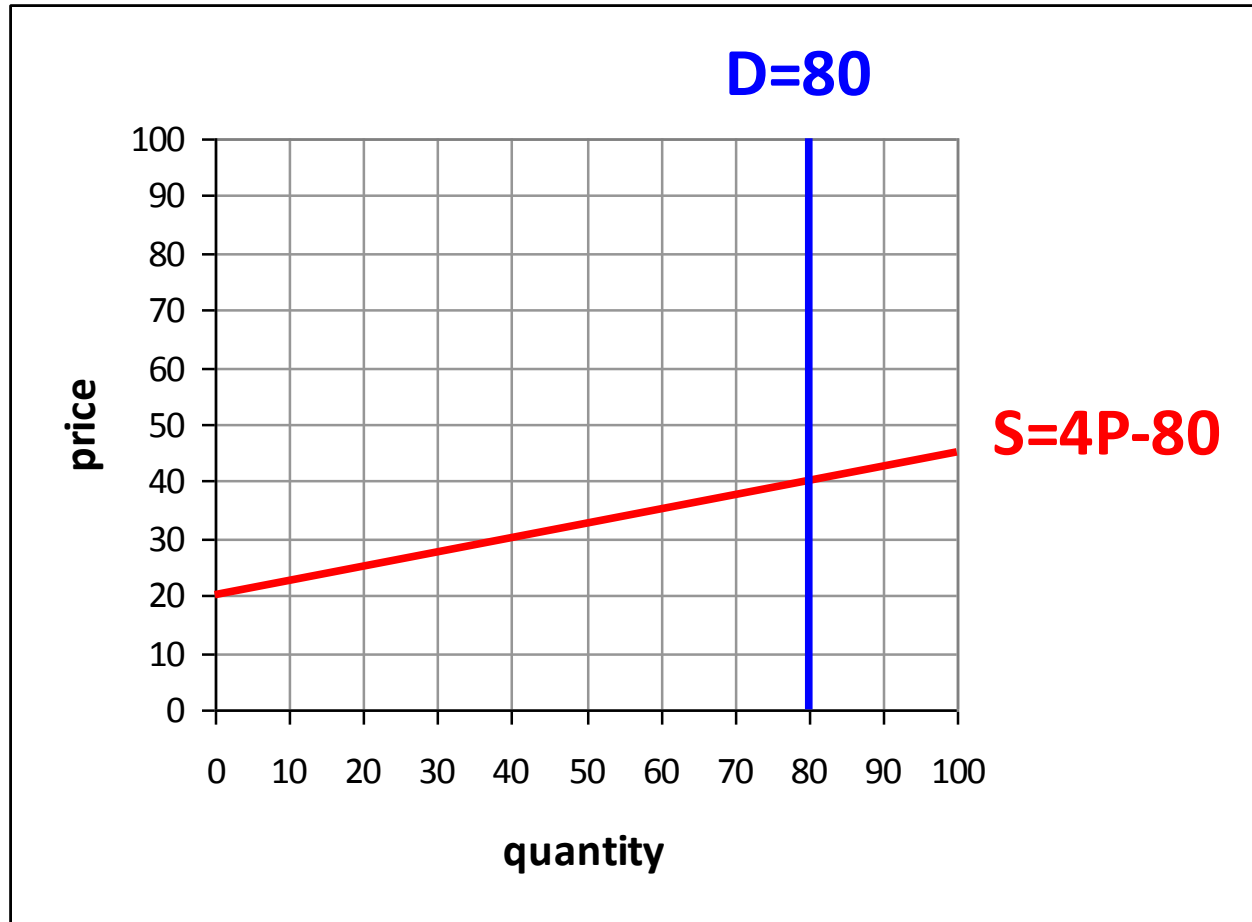
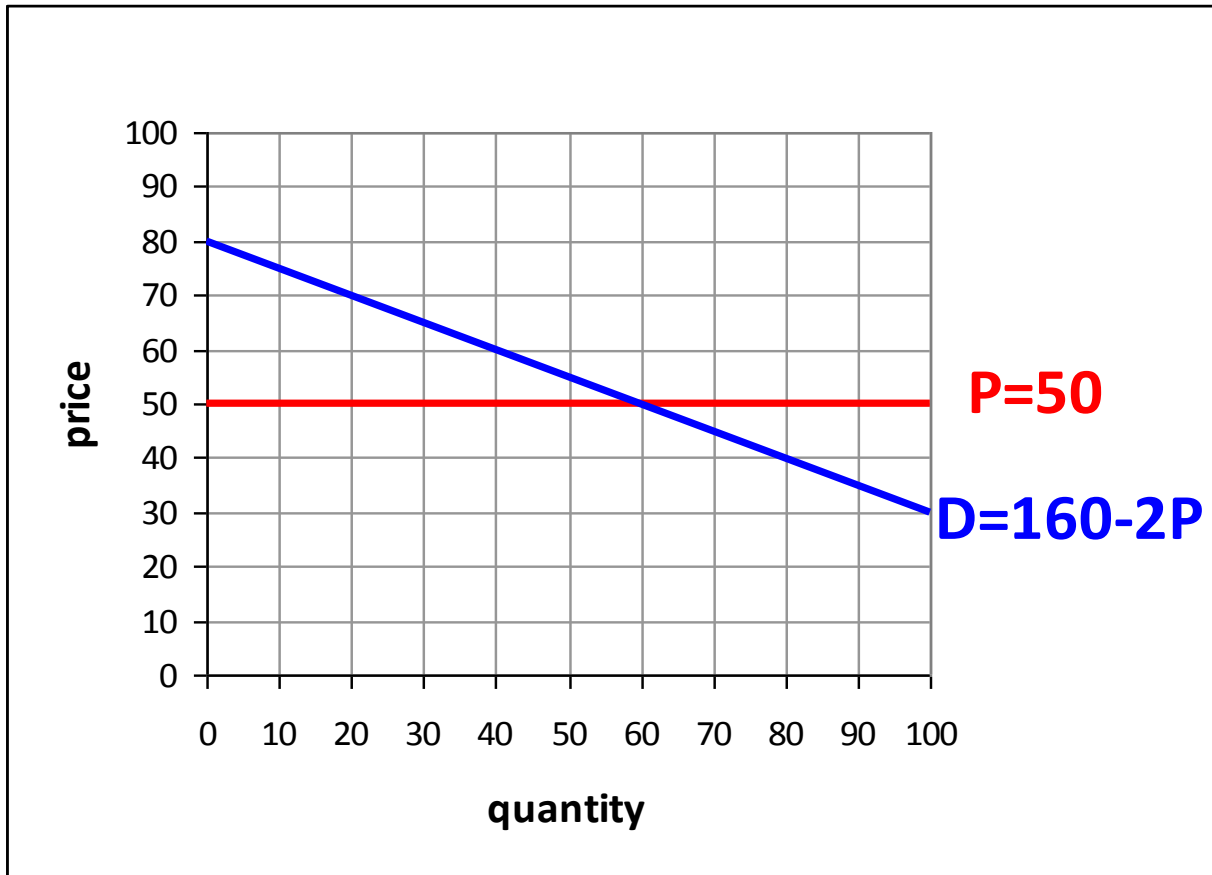A) –2   B) –1   C) 1/2   D) 1   **E) 2**

PERFECTLY INELASTIC SUPPLY

S=60

D=160-2P

The price elasticity of supply is zero.

PERFECTLY INELASTIC DEMAND

D=80

S=4P-80

The price elasticity of demand is zero.

PERFECTLY ELASTIC SUPPLY

P=50

D=160-2P

The price elasticity of supply is infinity.

PERFECTLY ELASTIC DEMAND
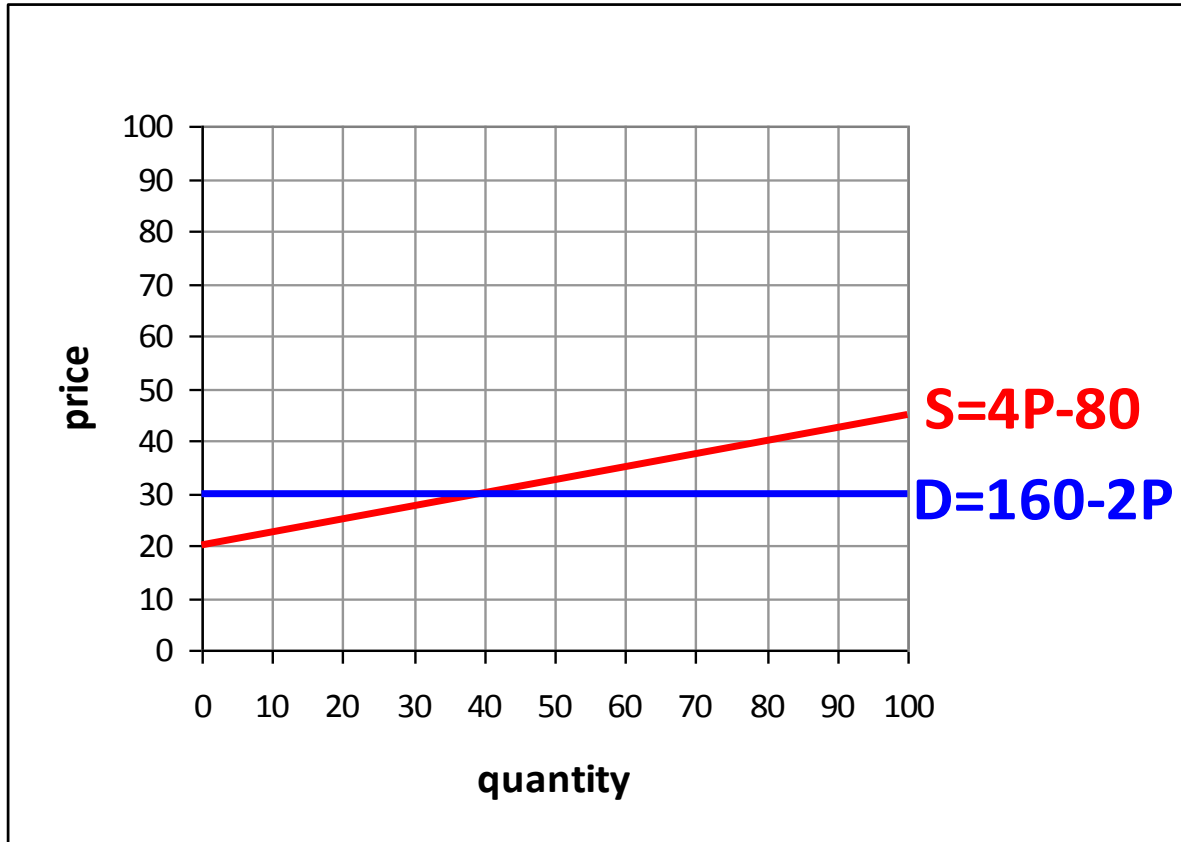
The price elasticity of demand is negative infinity.