Chapter 3 (Supply and Demand), part 2

Wednesday, June 23

QUESTION 1 (demand for snails)

snails	total benefit
1	$7
2	$12
3	$15
4	$16
5	$16

Ricky is a consumer of snails. He would be willing to pay a maximum of $7 for 1 snail, a maximum of $12 for two snails, and so on.

If the price of snails is $2, how many snails should Ricky buy?

A) 1 B) 2 C) 3 D) 4 E) 5

answer to question 1

snails	total benefit	marginal cost	marginal benefit
1	$7	$2	$7
2	$12	$2	$5
3	$15	$2	$3
4	$16	$2	$1
5	$16	$2	$0

If the price of snails is $2, how many snails should Ricky buy?

A) 1 B) 2 **C) 3** D) 4 E) 5

further explanation

snails	total benefit	marginal benefit	marginal cost	total cost	surplus
1	$7	$7	$2	$2	$5
2	$12	$5	$2	$4	$8
3	$15	$3	$2	$6	$9
4	$16	$1	$2	$8	$8
5	$16	$0	$2	$10	$6

Ricky should stop buying snails once the marginal benefit is no longer greater than the marginal cost. Notice that this is also the choice that gives him the greatest possible surplus (total benefit – total cost).

DERIVING A DEMAND SCHEDULE

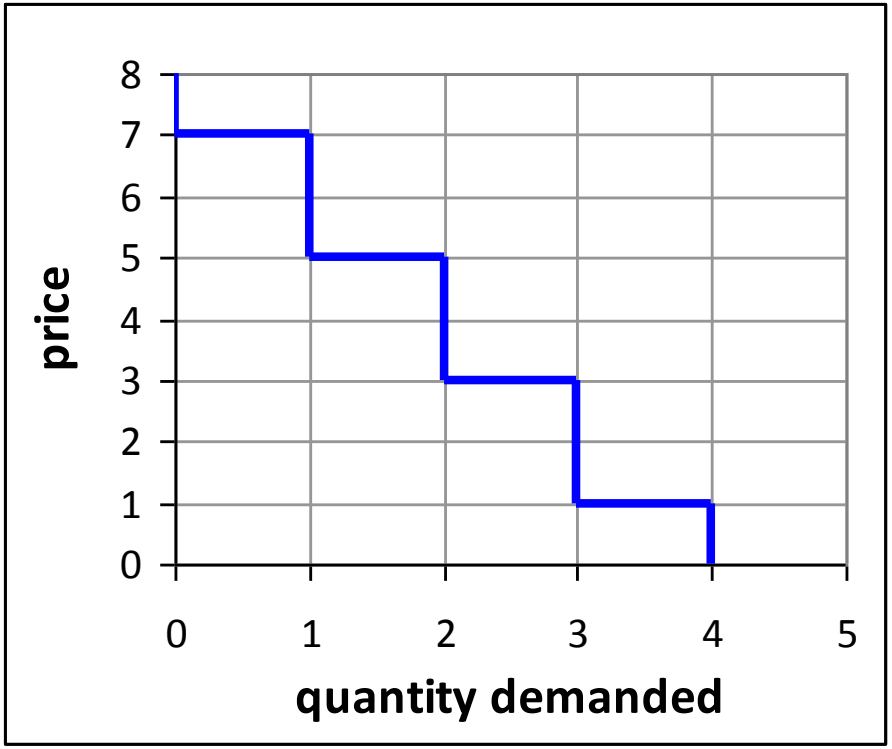
snails	total benefit	marginal benefit
1	$7	$7
2	$12	$5
3	$15	$3
4	$16	$1
5	$16	$0

price	quantity demanded
$0-$1	4
$1-$3	3
$3-$5	2
$5-$7	1
>$7	0

We assume that Ricky will buy snails until the price is greater than his marginal benefit.

GRAPHING A DEMAND SCHEDULE

price	quantity demanded
$0-$1	4
$1-$3	3
$3-$5	2
$5-$7	1
>$7	0



Like most demand curves, Ricky's demand for snails is downward-sloping.

QUESTION 2 (supply of snails)

snails	total cost
1	$1
2	$3
3	$7
4	$13
5	$21

Stan is a supplier of snails. It costs him $1 to find 1 snail, $3 to find 2 snails, and so on.

If the price of snails is $7, how many snails should Stan sell?

A) 1 B) 2 C) 3 D) 4 E) 5

answer to question 2

snails	total cost	marginal cost	marginal benefit
1	$1	$1	$7
2	$3	$2	$7
3	$7	$4	$7
4	$13	$6	$7
5	$21	$8	$7

If the price of snails is $7, how many snails should Stan sell?

A) 1 B) 2 C) 3 **D) 4** E) 5

further explanation

snails	total cost	marginal cost	marginal benefit	total benefit	surplus (profit)
1	$1	$1	$7	$7	$6
2	$3	$2	$7	$14	$11
3	$7	$4	$7	$21	$14
4	$13	$6	$7	$28	$15
5	$21	$8	$7	$35	$14

Stan should stop selling snails once the marginal benefit is no longer greater than the marginal cost. Notice that this is also the choice that gives him the greatest possible surplus (total benefit – total cost). This is because, as he adds each unit, his surplus changes by the difference between the marginal benefit and the marginal cost.

QUESTION 3 (find the correct supply schedule)

snails	total cost	marginal cost
1	$1	$1
2	$3	$2
3	$7	$4
4	$13	$6
5	$21	$8

Which is the correct supply schedule?

(A)

price	QS
$0-$1	0
$1-$2	1
$2-$3	2
$3-$4	3
$4-$5	4
>$5	5

(B)

price	QS
$0-$1	0
$1-$2	1
$2-$4	2
$4-$6	3
$6-$8	4
>$8	5

(C)

price	QS
$0-$2	0
$2-$4	1
$4-$8	2
$8-$16	3
$16-$32	4
>$32	5

(D)

price	QS
$0-$1	0
$1-$3	1
$3-$7	2
$7-$13	3
$13-$21	4
>$21	5

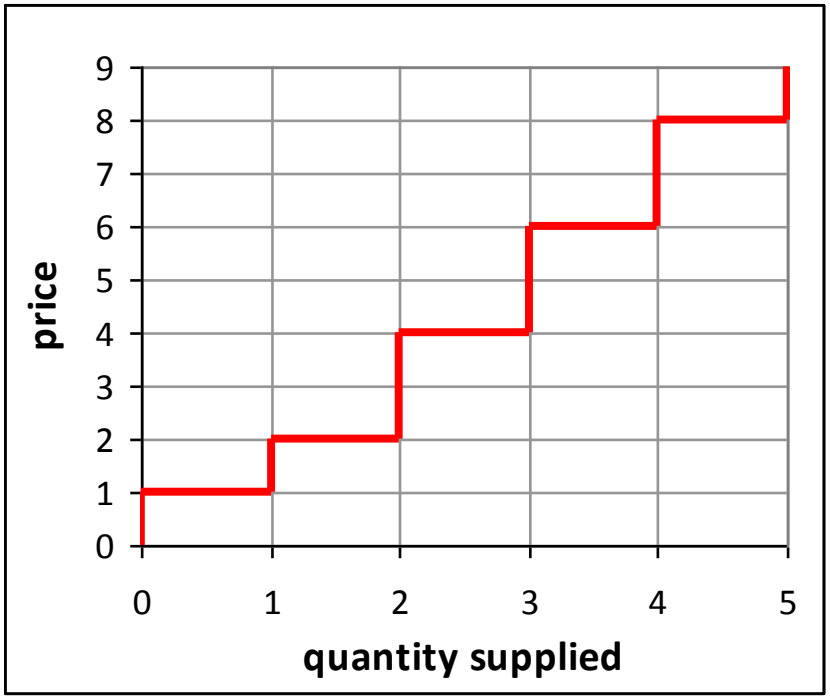
answer to question 3

snails	total cost	marginal cost
1	$1	$1
2	$3	$2
3	$7	$4
4	$13	$6
5	$21	$8

Which is the correct supply schedule?

(B)

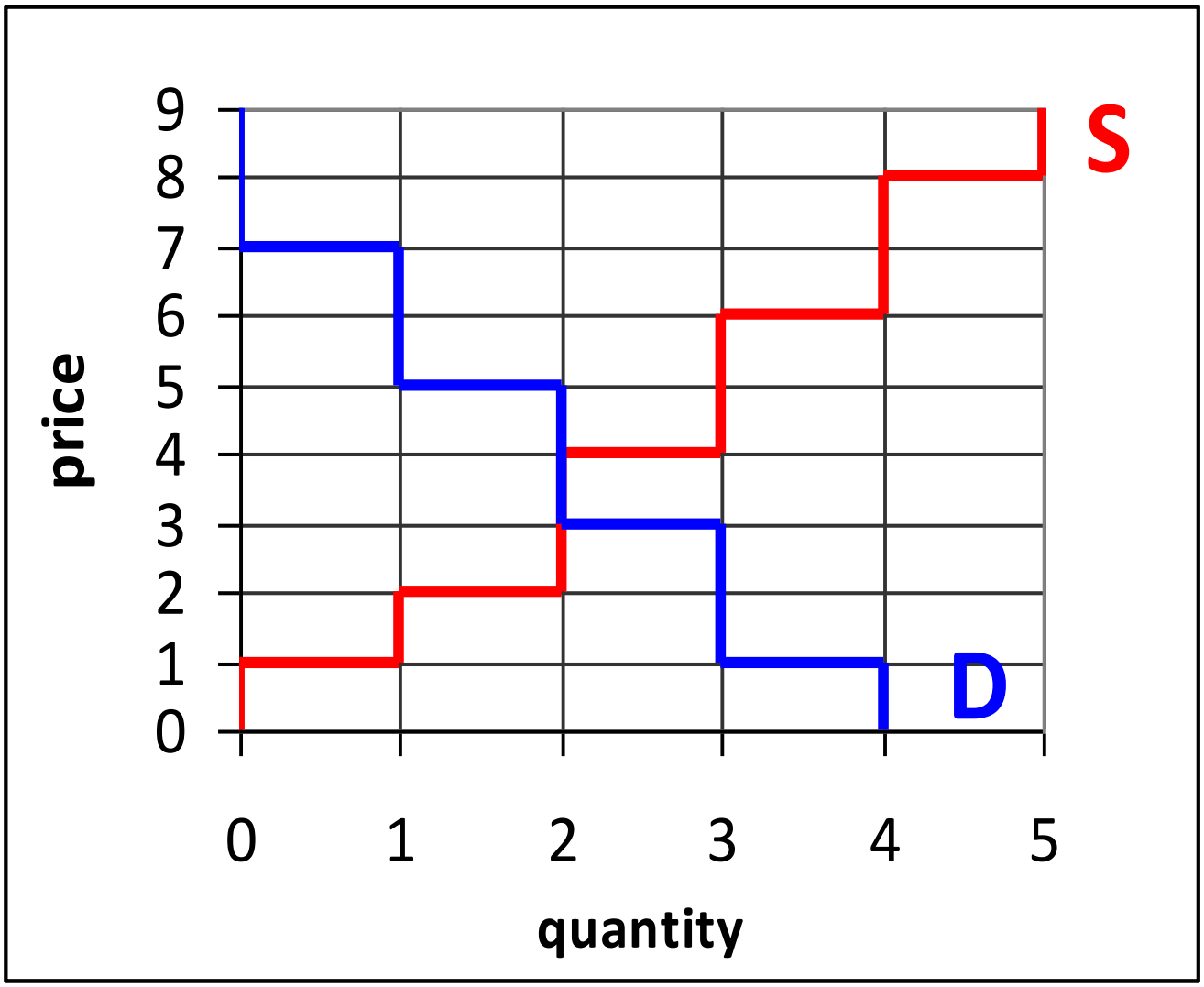
price	QS
$0-$1	0
$1-$2	1
$2-$4	2
$4-$6	3
$6-$8	4
>$8	5



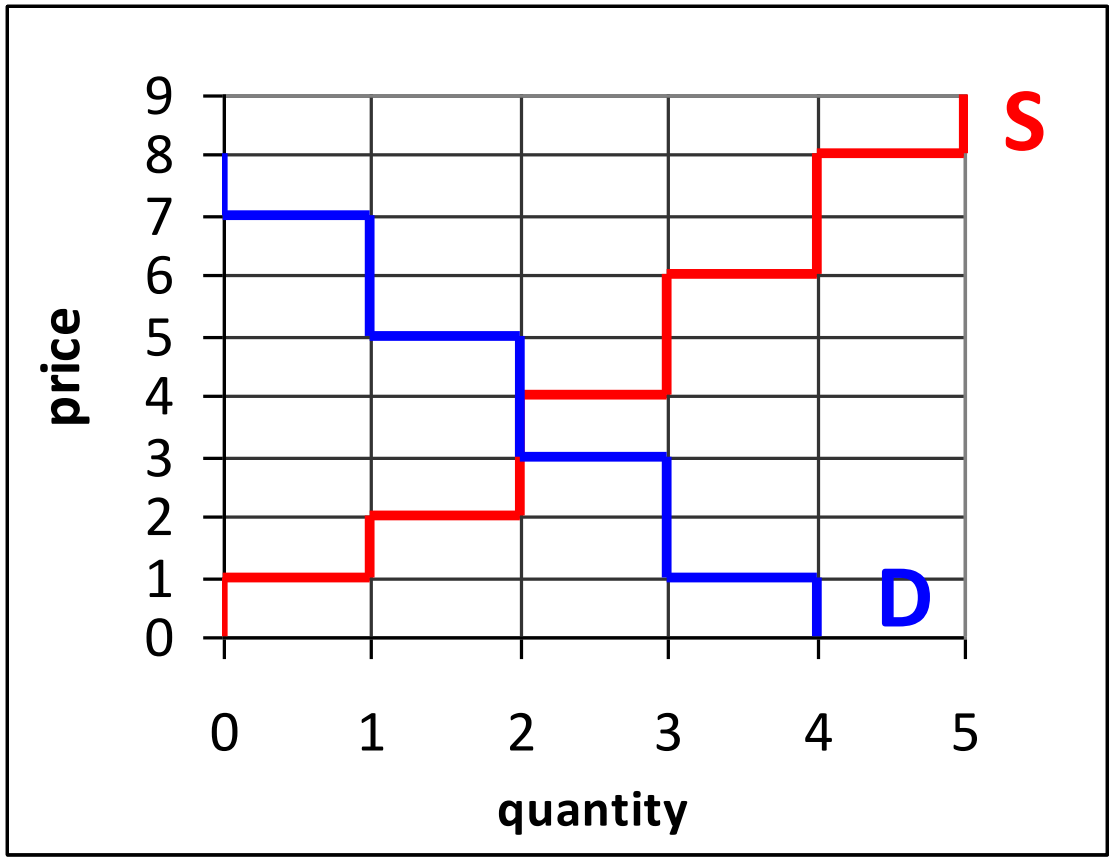
SUPPLY AND DEMAND (snails)

price	QD
$0-$1	4
$1-$3	3
$3-$5	2
$5-$7	1
>$7	0

price	QS
$0-$1	0
$1-$2	1
$2-$4	2
$4-$6	3
$6-$8	4
>$8	5



QUESTION 4 (reading supply and demand graph)



When the price is $1.50, then…

A) There is an excess supply of 3 snails.

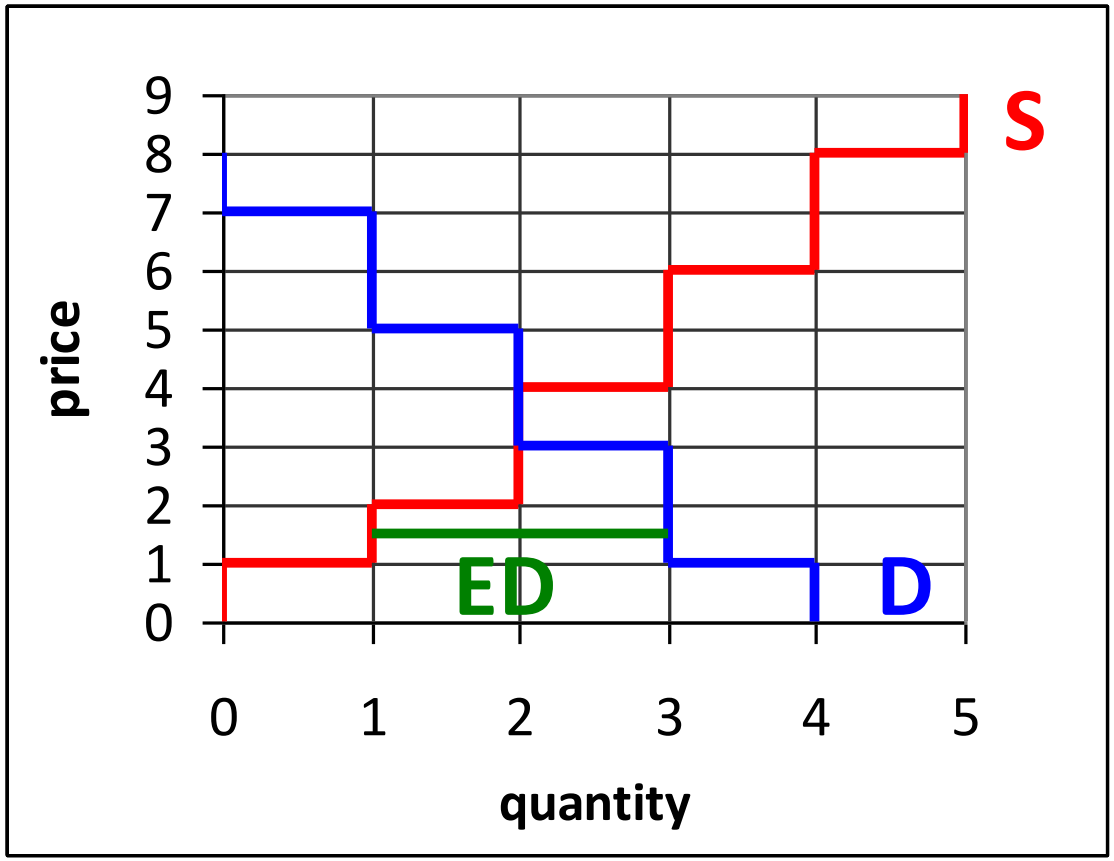
B) There is an excess supply of 2 snails.

C) The market is in equilibrium.

D) There is an excess demand of 2 snails.

E) There is an excess demand of 3 snails.

answer to question 4



When the price is $1.50, then...

A) There is an excess supply of 3 snails.

B) There is an excess supply of 2 snails.

C) The market is in equilibrium.

D) There is an excess demand of 2 snails.

E) There is an excess demand of 3 snails.

DEMAND FOR FRUITS

fruits	1	2	3	4	5	6	7
total benefit	$6	$12	$16	$20	$22	$24	$24

Max is a buyer of fruit. The table above shows his total benefit or willingness to pay for various amounts of fruit.

QUESTION 5 (find the correct demand schedule)

fruits	1	2	3	4	5	6	7
total benefit	$6	$12	$16	$20	$22	$24	$24
marginal benefit	$6	$6	$4	$4	$2	$2	$0

Which is the correct demand schedule?

(A)

price	QD
$0-$2	1
$2-$4	2
$4-$6	3
>$6	4

(B)

price	QD
$0-$2	0
$2-$4	2
$4-$6	4
>$6	6

(C)

price	QD
$0-$2	3
$2-$4	2
$4-$6	1
>$6	0

(D)

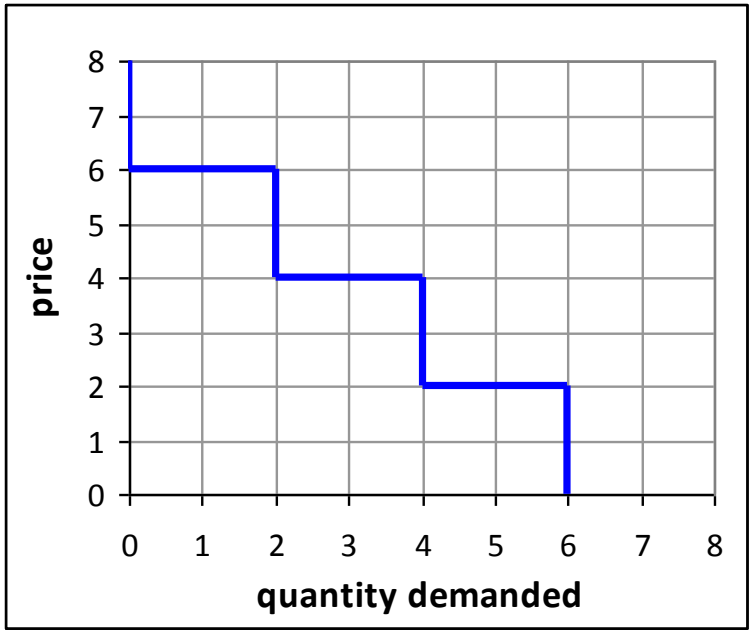
price	QD
$0-$2	6
$2-$4	4
$4-$6	2
>$6	0

answer to question 5

fruits	1	2	3	4	5	6	7
total benefit	$6	$12	$16	$20	$22	$24	$24
marginal benefit	$6	$6	$4	$4	$2	$2	$0

Which is the correct demand schedule?

Notice that the height of the demand schedule is the marginal benefit!



(D)

price	QD
$0-$2	6
$2-$4	4
$4-$6	2
>$6	0

SUPPLY OF FRUITS

fruits	1	2	3	4	5	6	7
total benefit	$1	$4	$7	$12	$17	$24	$31

Julie is a supplier of fruits. The table above shows her total cost for acquiring various amounts of fruit. (These can be explicit or implicit costs.)

QUESTION 6 (find the correct supply schedule)

fruits	1	2	3	4	5	6	7
total cost	$1	$4	$7	$12	$17	$24	$31
marginal cost	$1	$3	$3	$5	$5	$7	$7

Which is the correct supply schedule?

(A)

price	QS
$0-$1	0
$1-$3	1
$3-$5	2
$5-$7	3
>$7	4

(B)

price	QS
$0-$1	0
$1-$3	1
$3-$5	3
$5-$7	5
>$7	7

(C)

price	QS
$0-$1	1
$1-$2	3
$2-$3	3
$3-$4	5
$4-$5	5

(D)

price	QS
$0-$1	4
$1-$3	3
$3-$5	2
$5-$7	1
>$7	0

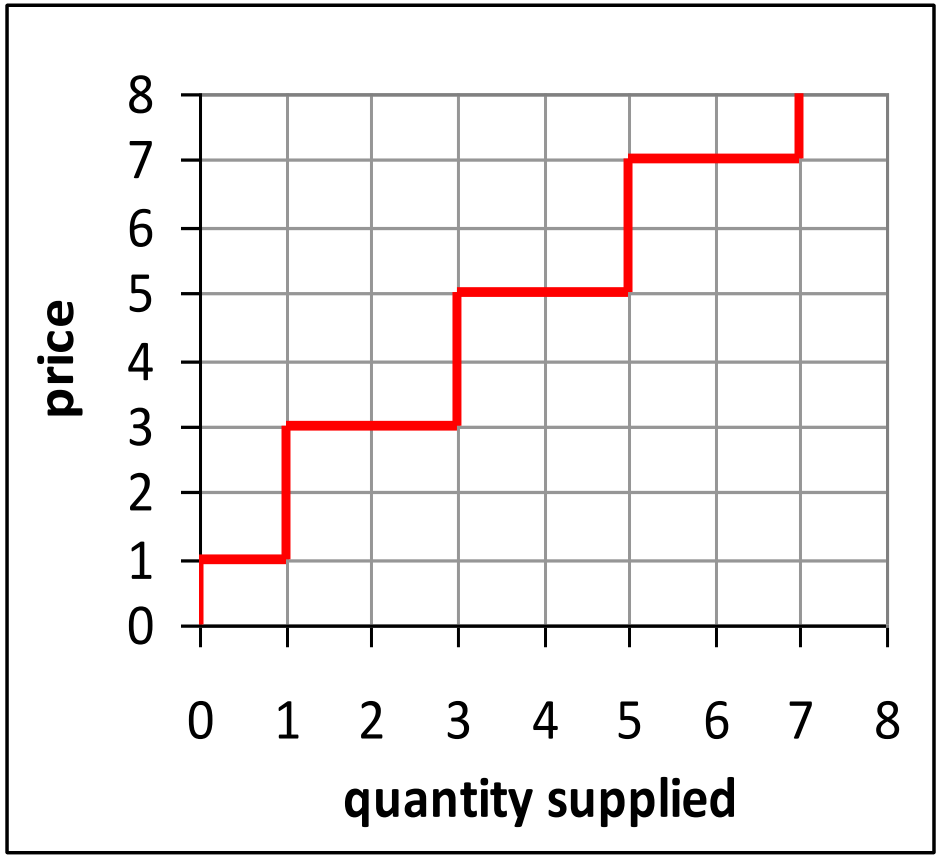
answer to question 6

fruits	1	2	3	4	5	6	7
TC	$1	$4	$7	$12	$17	$24	$31
MC	$1	$3	$3	$5	$5	$7	$7

Notice that the height of the supply schedule is the marginal cost!

(B)

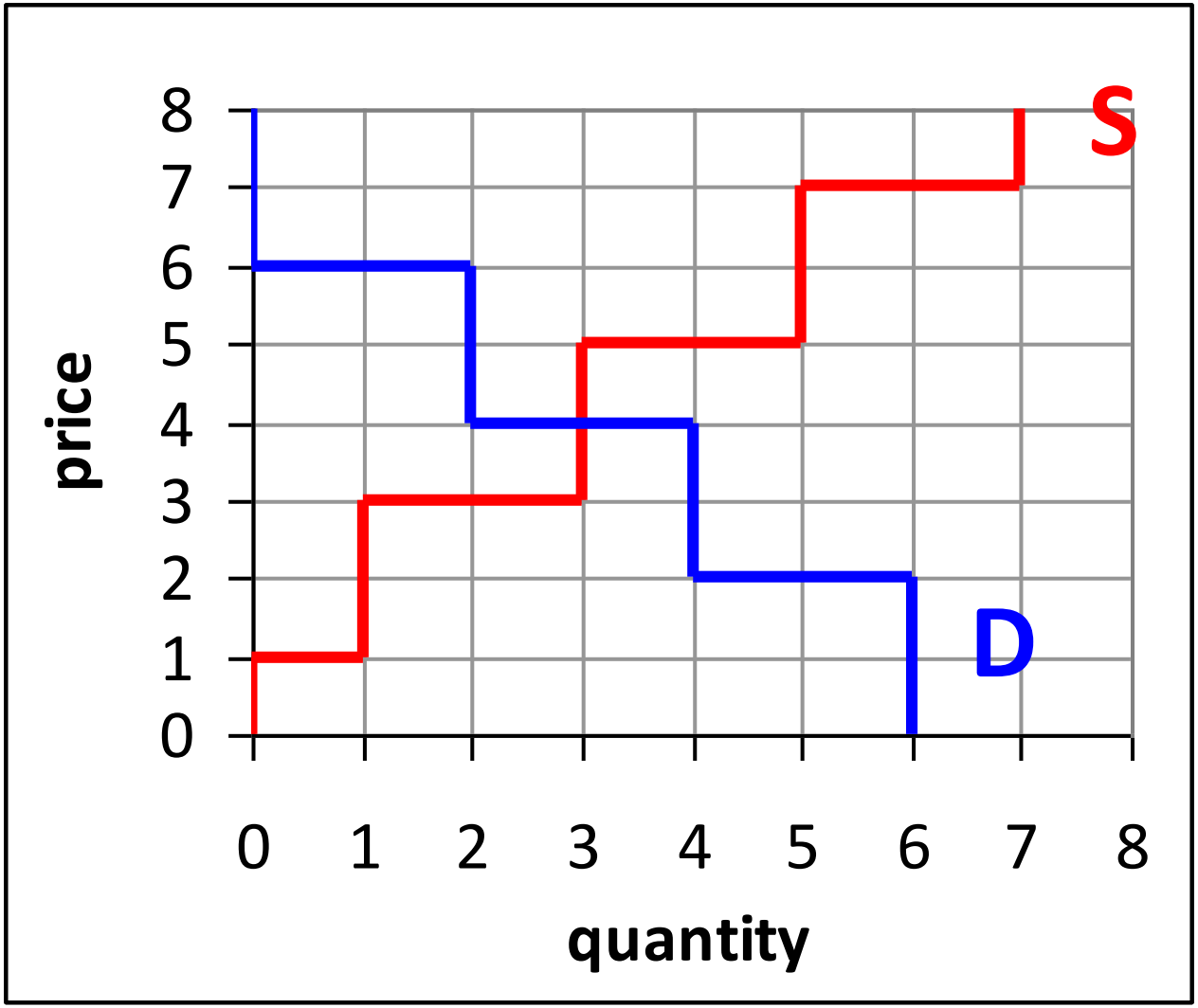
price	QS
$0-$1	0
$1-$3	1
$3-$5	3
$5-$7	5
>$7	7



SUPPLY AND DEMAND (fruits)

price	QD
$0-$2	6
$2-$4	4
$4-$6	2
>$6	0

price	QS
$0-$1	0
$1-$3	1
$3-$5	3
$5-$7	5
>$7	7



HORIZONTAL AND VERTICAL INTERPRETATIONS

demand

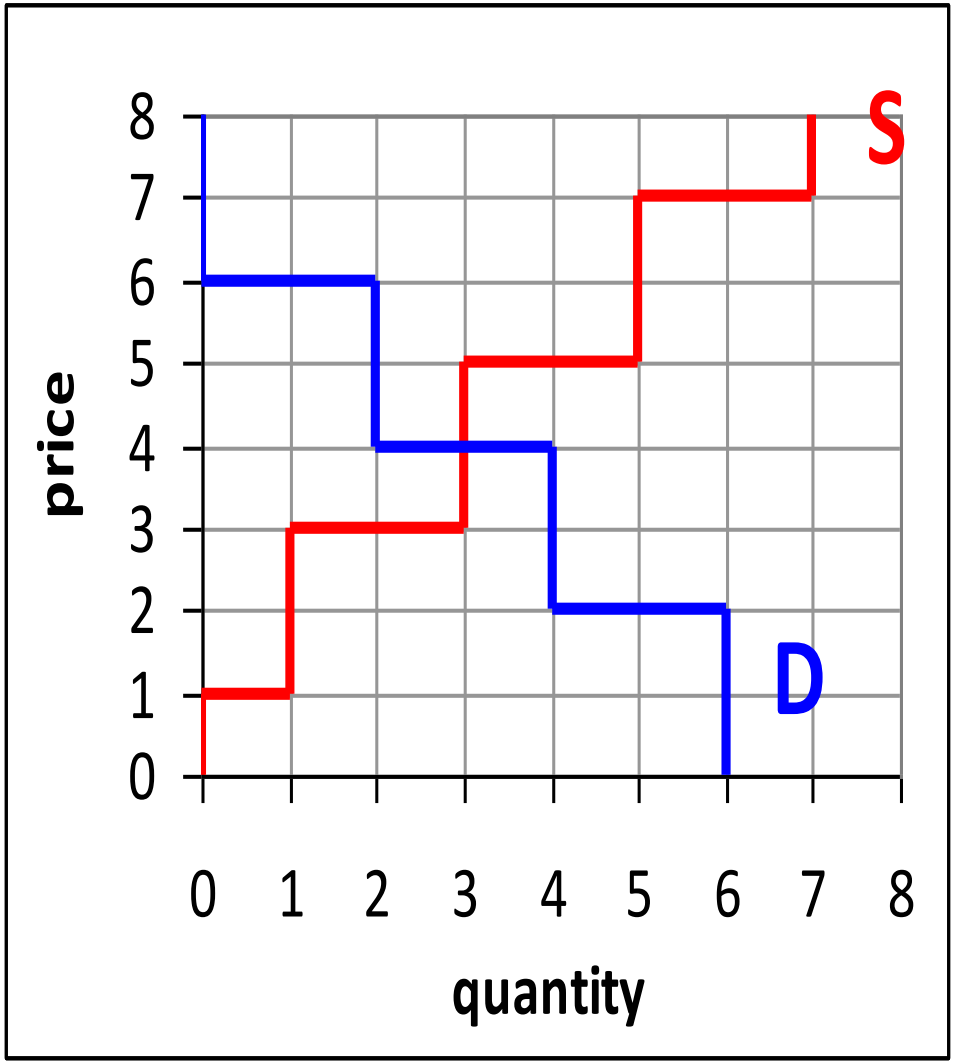
price	QD
$0-$2	6
$2-$4	4
$4-$6	2
>$6	0

Q	MB
1,2	6
3,4	4
5,6	2
7+	0

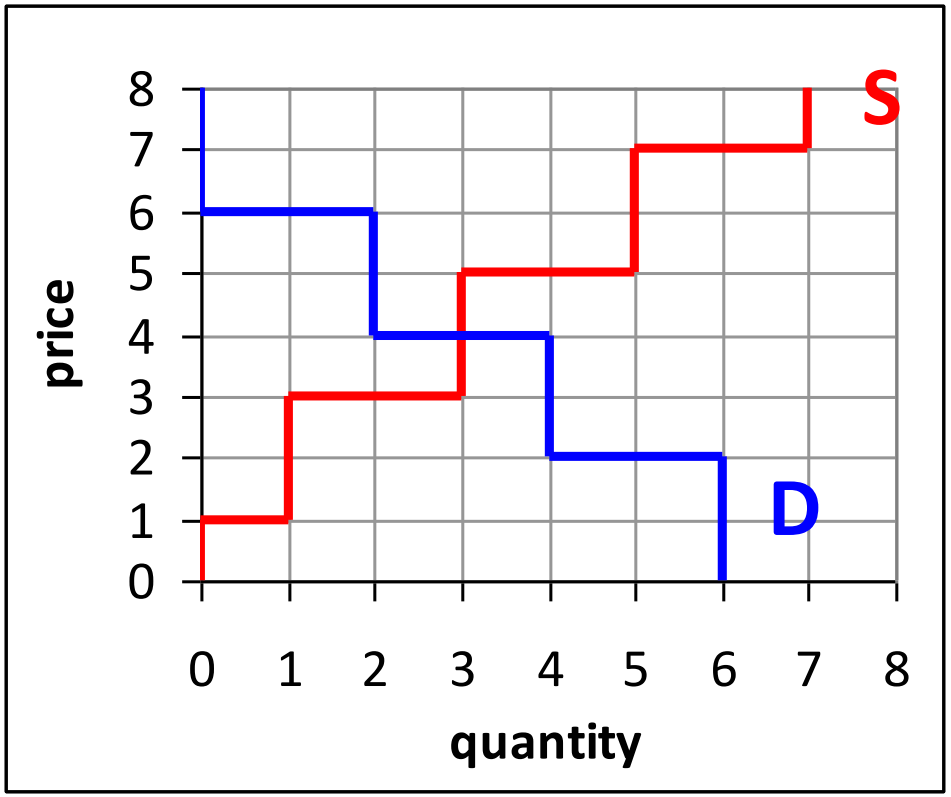
supply

price	QS
$0-$1	0
$1-$3	1
$3-$5	3
$5-$7	5
>$7	7

Q	MC
1	1
2,3	3
4,5	5
6,7	7



HORIZONTAL AND VERTICAL INTERPRETATIONS



The horizontal width of the demand curve represents the quantity demanded at each price.

The vertical height of the demand curve represents the marginal benefit from each unit.

The horizontal width of the supply curve represents the quantity supplied at each price.

The vertical height of the supply curve represents the marginal cost of each unit.

CONTINUOUS SUPPLY

Jill is a supplier of lemonade.

Suppose that lemonade is sold not one cup at a time, but by a continuous unit of measurement, e.g. quarts or fluid ounces.

Suppose that, if Q represents quarts of lemonade supplied, then Jill's total cost of producing this much lemonade will be Q^2.

$$TC(Q) = Q^2$$

More to the point, if Jill produces Q quarts of lemonade, then her marginal cost for the last unit will be 2Q.

$$MC(Q) = 2Q$$

CONTINUOUS SUPPLY

Q represents quarts of lemonade supplied.

$$TC(Q) = Q^2$$

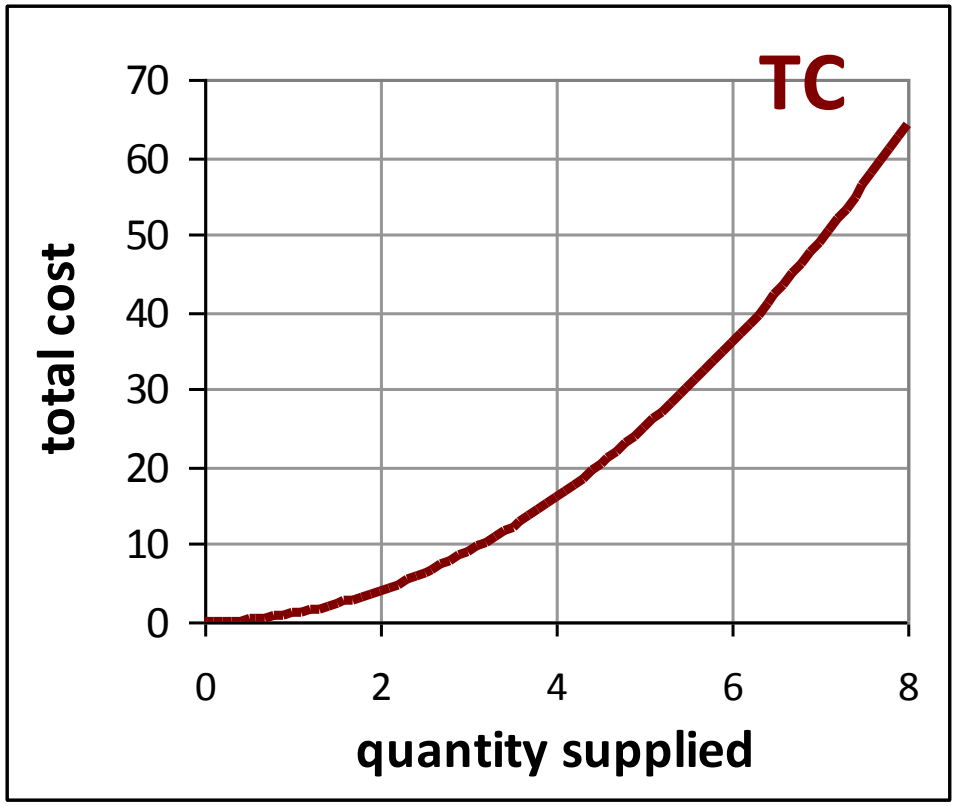
$$MC(Q) = 2Q$$

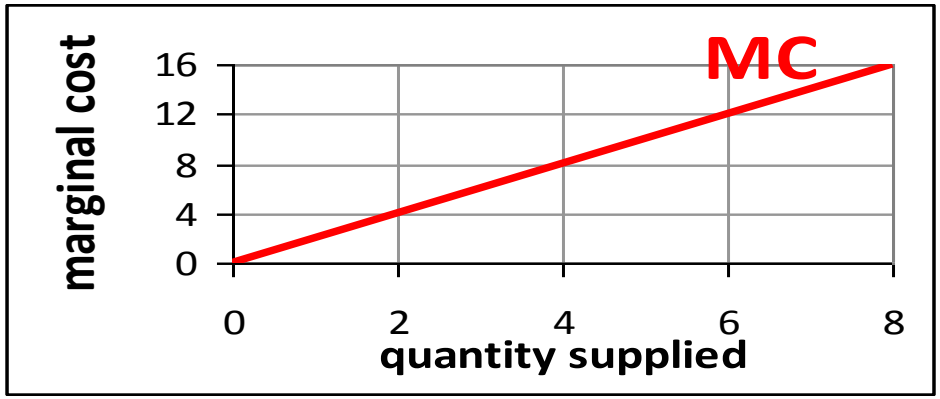
For example, if Jill produces 10 quarts of lemonade, then her total cost will be $100, and her marginal cost for the last unit will be $20.

That is, if she added another quart of lemonade, to make it 11 quarts, then it would cost her an extra $20, approximately.

Or (more accurately), if she added another tenth of a quart, to make it 10.1 quarts, it would cost her an extra $2, approximately.

CONTINUOUS SUPPLY (graphs)





$$TC(Q) = Q^2$$

$$MC(Q) = 2Q$$

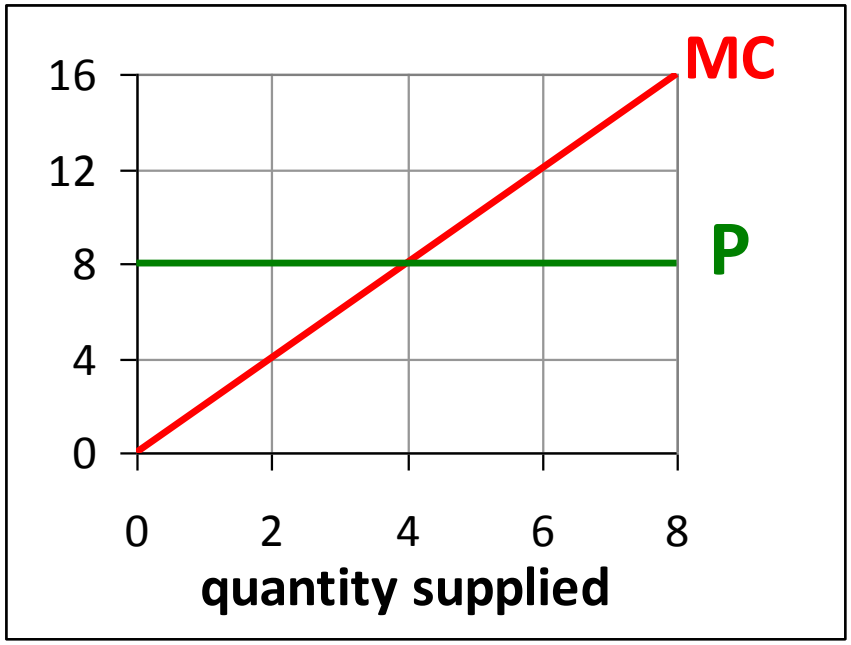
Marginal cost is the cost of adding an additional unit, or

$$MC = \frac{\Delta TC}{\Delta Q}$$

Thus, the marginal cost curve gives the slope of the total cost curve at every point.

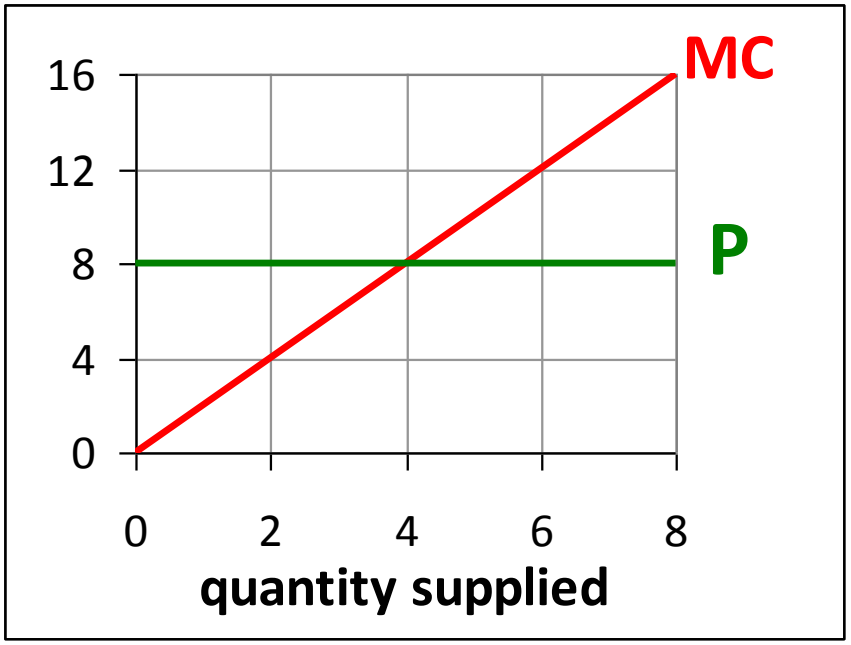
CONTINUOUS SUPPLY (quantity supplied)

Recall that a rational seller in a competitive market will continue to produce more units until the marginal benefit (in this case, the price) is no longer greater than the marginal cost.



For example, if the price is $8, then the seller's optimal quantity is the quantity at which the marginal cost is $8. In this case, the optimal, profit-maximizing quantity is 4 quarts of lemonade.

CONTINUOUS SUPPLY (supply curve)

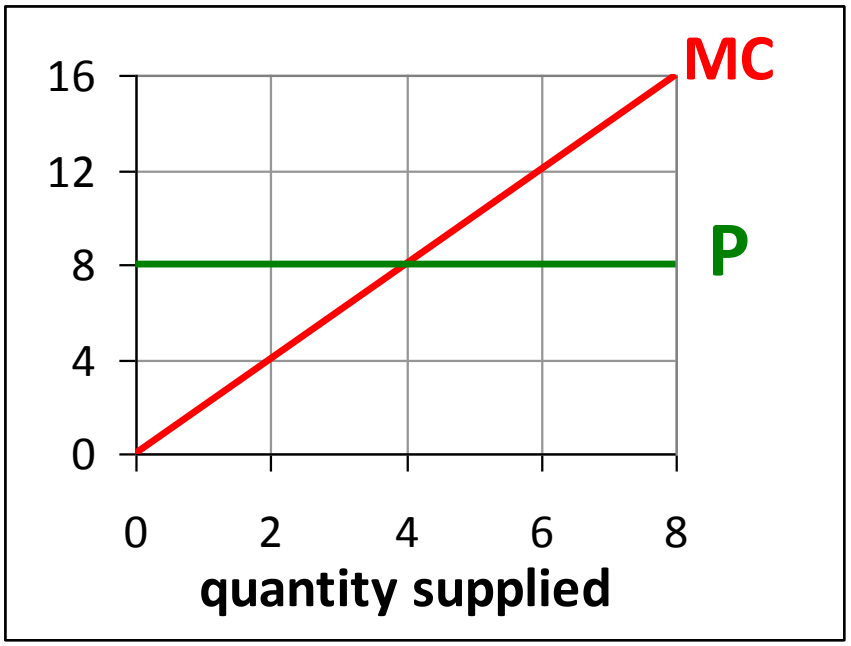


So, at any given price, the marginal cost curve tells us how many units the seller can produce before the marginal cost becomes greater than the price or marginal revenue, and thus, the optimal number of units to produce.

Thus, as long as the firm is taking price as given, the marginal cost curve and the supply curve are one and the same.

The vertical interpretation of this curve gives us marginal cost as a function of quantity supplied, and the horizontal interpretation gives us quantity supplied as a function of price.

CONTINUOUS SUPPLY (algebra)



Recall that this marginal cost curve has the equation MC(Q) = 2Q

This is the vertical interpretation of the graph, or the inverse supply function.

If MC = 2Q, then quantity supplied is what function of price?

Since a profit maximizing, price taking firm decides its quantity supplied by setting P = MC, we have P = 2Q, and thus Q = P/2. This is the horizontal interpretation of the graph, or the supply function.

QUESTION 7 (finding QS from MC function)

Jill's marginal cost of producing lemonade is given by the equation MC = 2Q, where Q is how many quarts of lemonade she produces.

If the going price of lemonade is $4 per quart (and Jill has no choice but to sell at this price), then how many quarts should she sell, to maximize her profit?

A) 1 B) 2 C) 4 D) 8 E) 16

answer to question 7

Jill's marginal cost of producing lemonade is given by the equation MC = 2Q, where Q is how many quarts of lemonade she produces.

If the going price of lemonade is $4 per quart (and Jill has no choice but to sell at this price), then how many quarts should she sell, to maximize her profit?

A) 1 **B) 2** C) 4 D) 8 E) 16

P=MC, MC=2Q → P=2Q → Q=P/2 → Q=4/2 → Q=2

QUESTION 8 (finding QS from MC function)

Murray's marginal cost of producing lemonade is given by the equation MC = 2Q + 10, where Q is how many quarts of lemonade he produces.

If the going price of lemonade is $20 per quart, then how many quarts should he sell, to maximize his profit?

A) 1 B) 2 C) 3 D) 4 E) 5

answer to question 8

Murray's marginal cost of producing lemonade is given by the equation MC = 2Q + 10, where Q is how many quarts of lemonade he produces.

If the going price of lemonade is $20 per quart, then how many quarts should he sell, to maximize his profit?

A) 1 B) 2 C) 3 D) 4 **E) 5**

P=MC, MC=2Q+10 → P=2Q+10 → 2Q=P-10 → Q=P/2-5 → Q=20/2-5 → Q=5

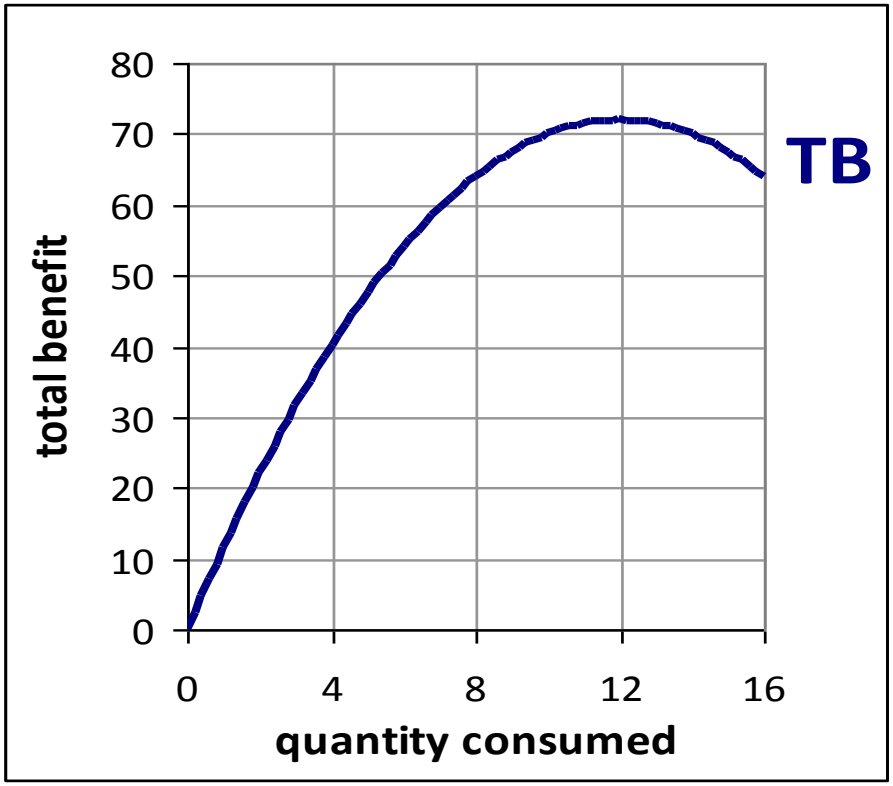
CONTINUOUS DEMAND

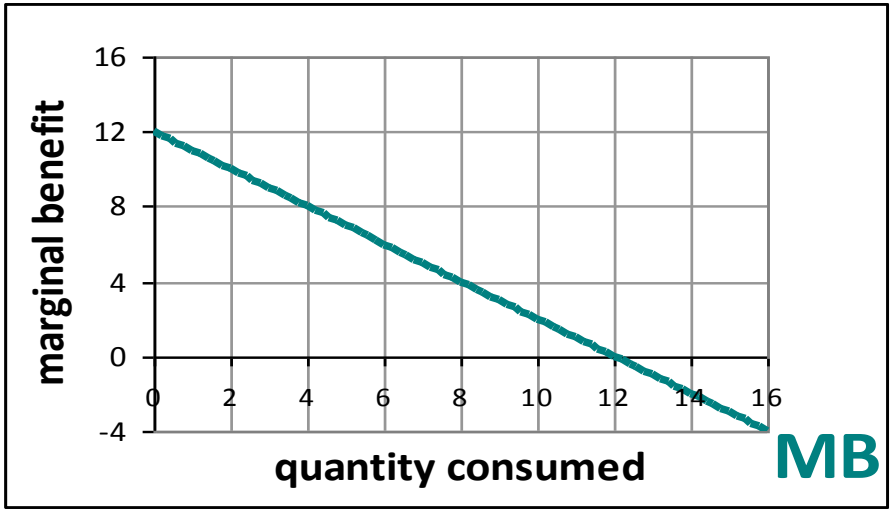
Jack is a consumer of lemonade.

His total benefit or willingness to pay for lemonade is given by $TB(Q) = 12Q - Q^2/2$

More to the point, his marginal benefit is given by the function $MB(Q) = 12 - Q$.

CONTINUOUS DEMAND (graphs)





TB(Q) = 12Q – $Q^2/2$

MB(Q) = 12 – Q

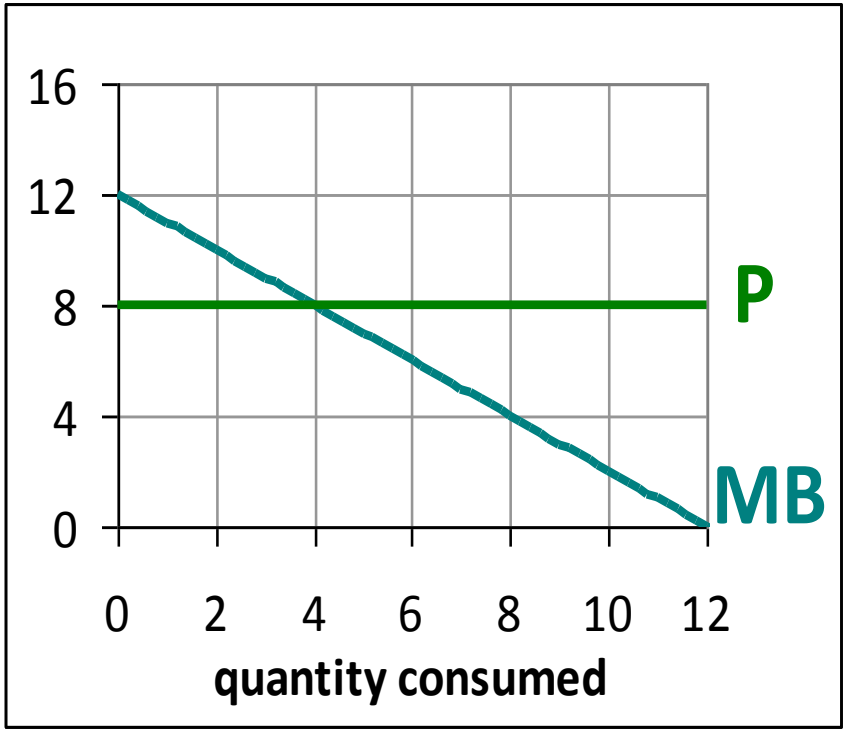
Marginal benefit is the benefit of adding an additional unit, or

$$MB = \frac{\Delta TB}{\Delta Q}$$

Thus, the marginal benefit curve gives the slope of the total benefit curve at every point.

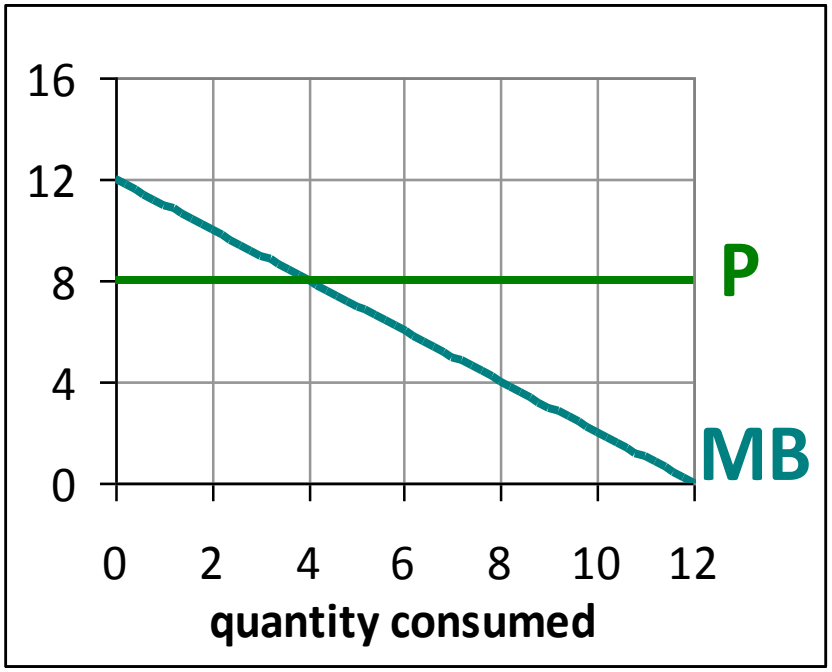
CONTINUOUS DEMAND (quantity demanded)

Recall that a rational consumer in a competitive market will continue to buy more units until the marginal benefit is no longer greater than the marginal cost (in this case, the price).



For example, if the price is $8, then the consumer's optimal quantity is the quantity at which the marginal benefit $8. In this case, the optimal, surplus-maximizing quantity is 4 quarts of lemonade.

CONTINUOUS DEMAND (demand curve)

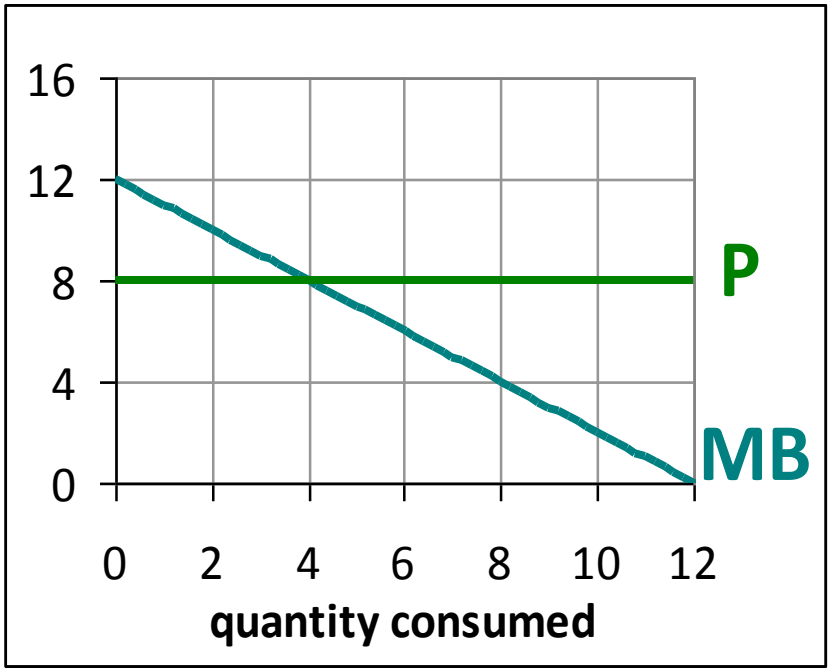


So, at any given price, the marginal benefit curve tells us how many units the buyer can consume before the marginal benefit becomes less than the price or marginal cost, and thus, the optimal number of units to consume.

Thus, as long as the buyer is taking price as given, the marginal benefit curve and the demand curve are one and the same.

The vertical interpretation of this curve gives us marginal benefit as a function of quantity consumed, and the horizontal interpretation gives us quantity consumed as a function of price.

CONTINUOUS DEMAND (algebra)



Recall that this marginal benefit curve has the equation MB(Q) = 12 – Q

This is the vertical interpretation of the graph, or the inverse demand function.

If MB = 12 - Q, then quantity supplied is what function of price?

Since a surplus-maximizing, price-taking consumer decides his quantity demanded by setting P = MB, we have P = 12 - Q, and thus Q = 12 - P. This is the horizontal interpretation of the graph, or the demand function.

QUESTION 9 (finding QD from MB function)

Jack's marginal benefit of consuming lemonade is given by the equation MB(Q) = 12 – Q, where Q is the number of quarts of lemonade he consumes.

If the going price of lemonade is $4 per quart (and Jack has no choice but to buy at this price), then how many quarts should he buy, to maximize his surplus?

A) 1 B) 2 C) 4 D) 8 E) 16

answer to question 9

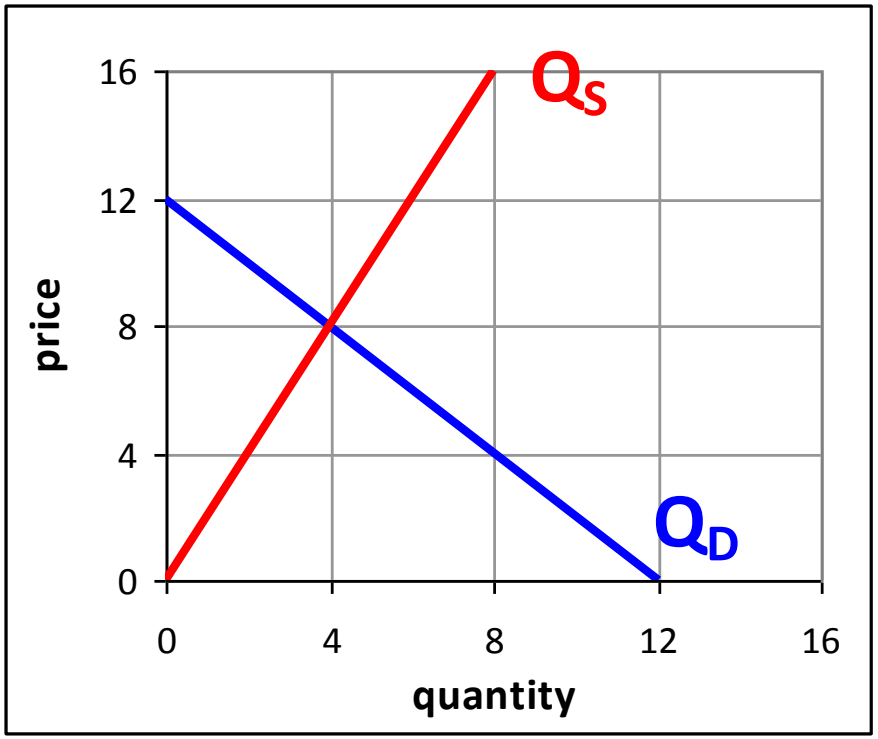
Jack's marginal benefit of consuming lemonade is given by the equation MB(Q) = 12 – Q, where Q is the number of quarts of lemonade he consumes.

If the going price of lemonade is $4 per quart (and Jack has no choice but to buy at this price), then how many quarts should he buy, to maximize his surplus?

A) 1 B) 2 C) 4 D) 8 E) 16

P=MB, MB=12-Q → P=12-Q → Q=12-P → Q=12-4 → Q=8

CONTINUOUS SUPPLY AND DEMAND (algebra)



$MC(Q_S) = 2Q_S$.
Thus, $P = 2Q_S$, and
$Q_S = P/2$.

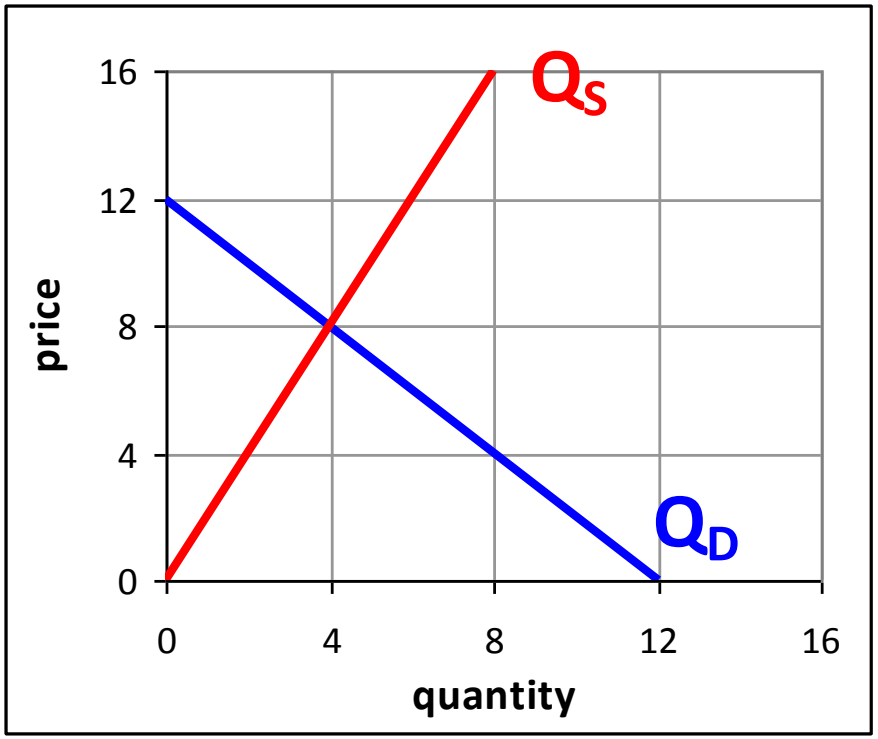
$MB(Q_D) = 12 - Q_D$.
Thus, $P = 12\text{-}Q_D$, and
$Q_D = 12\text{-}P$.

At market equilibrium, $Q_S = Q_D$. You can use this to solve for equilibrium price and quantity.

$P/2 = 12 - P \rightarrow 3P/2 = 12 \rightarrow P^* = 8$

$Q_S^* = P^*/2 = 8/2 = 4$ and $Q_D^* = 12 - P^* = 12 - 8 = 4$

CONTINUOUS SUPPLY AND DEMAND (algebra)



$MC(Q_S) = 2Q_S$.
Thus, $P = 2Q_S$, and
$Q_S = P/2$.

$MB(Q_D) = 12 - Q_D$.
Thus, $P = 12 - Q_D$, and
$Q_D = 12 - P$.

At market equilibrium, P=MC, and P=MB. Thus, MC=MB. You can use this to solve for equilibrium quantity and price.

$2Q = 12 - Q \rightarrow 3Q = 12 \rightarrow Q^* = 4$

$P^* = MC(Q^*) = 2Q^* = 8$ or $P^* = MB(Q^*) = 12 - Q^* = 8$

QUESTION 10 (algebra)

Consumer marginal benefit MB is given by the function $MB(Q_D) = 6 - .25Q_D$. Assuming that consumers are price takers, and will demand up to the point where P=MB, then which is the correct demand function $Q_D(P)$?

A) $Q_D = 24 - 4P$
B) $Q_D = 6 - 4P$
C) $Q_D = 6 - .25P$
D) $Q_D = 6P - .25P^2$
E) $Q_D = 6 + .25P$

answer to question 10

Consumer marginal benefit MB is given by the function $MB(Q_D) = 6 - .25Q_D$. Assuming that consumers are price takers, and will demand up to the point where P=MB, then which is the correct demand function $Q_D(P)$?

A) $Q_D = 24 - 4P$
B) $Q_D = 6 - 4P$
C) $Q_D = 6 - .25P$
D) $Q_D = 6P - .25P^2$
E) $Q_D = 6 + .25P$

P = MB, MB = 6-.25Q → P = 6 - .25Q
→ .25Q = 6 - P → Q = 24 - 4P

QUESTION 11

Marginal benefit (inverse demand) function:
$MB = 6 - .25Q_D$

Demand function: $Q_D = 24 - 4P$

Marginal cost (inverse supply) function: $MC = .5Q_S$

Supply function: $Q_S = 2P$

What is the equilibrium price, P^*, at which quantity supplied equals quantity demanded (and marginal benefit equals marginal cost)?

A) $P^* = 1$ **B) $P^* = 2$** **C) $P^* = 6$**
D) $P^* = 4$ **E) $P^* = 8$**

answer to question 11

$MB = 6 - .25Q_D$ $\quad Q_D = 24 - 4P$

$MC = .5Q_S$ $\quad Q_S = 2P$

What is the equilibrium price, P^*, at which quantity supplied equals quantity demanded (and marginal benefit equals marginal cost)?

A) $P^* = 1$ B) $P^* = 2$ C) $P^* = 6$

D) $P^* = 4$ E) $P^* = 8$

$Q_S = Q_D \rightarrow 2P = 24 - 4P \rightarrow 6P = 24 \rightarrow P^* = 4$