Microeconomics and mathematics (with answers)

1 Markets, demand and supply

Remarks:
- Abbreviations: Q = Quantity / P = Price / Q_d = Demand / Q_S = Supply
- Q_d, Q_S, P > 0
- Questions 5 and 6: You have to be familiar with quadratic equations. You can solve them either by factorization (if possible) or by using the formula.

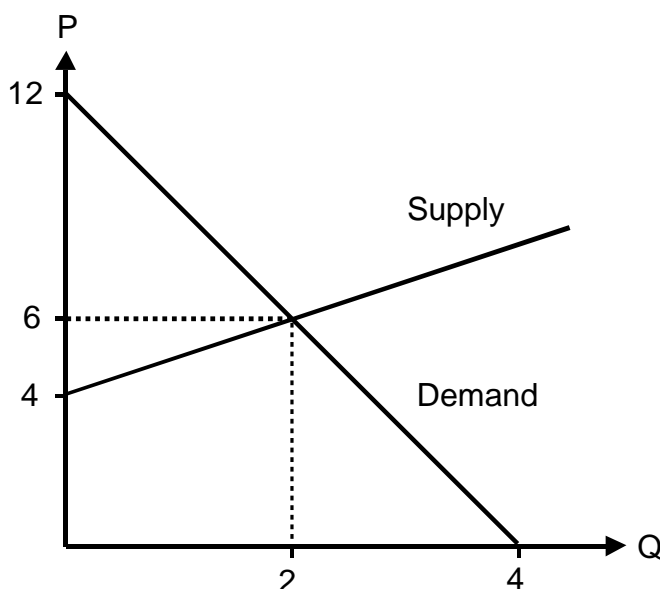|	

1.1	$Q_d = 60 - 3P$
	 $Q_S = -40 + 5P$
	
	 1.11 Calculate the quantity demanded if the price is
	    • 6
	    • 2.5
	
	 1.12 Calculate the quantity supplied if the price is
	    • 12
	    • 16.4
	
	 1.13 Calculate the market equilibrium (P and Q).
	
	 1.14 Rearrange the demand and supply function to obtain inverse functions: (P = ...)
	
	 1.15 Graph this market (x-axis: Q / y-axis: P).

1.2	Which are the demand and the supply function (P = ...) for the following market?
1.3	$P = 4 + 0.5 \cdot Q_S$ 1.31 Graph supply. 1.32 When graphing supply, which role do the values of 4 and 0.5 play?

1.4	Demand and supply on a market:

Price	Demand	Supply
120	0	80
110	5	70
100	10	60
90	15	50
80	20	40
70	25	30
60	30	20
50	35	10
40	40	0

1.41   Graph this market.

1.42   Find the demand and the supply function (P = ...).

1.43   Calculate the market equilibrium (P, Q).

1.5	$Q_d = 8 - P$ $Q_s = -4 + P^2$

1.51   Calculate the market equilibrium.

1.52   Sketch this market.

1.6	$Q_d = 8 - 3P$ $Q_s = -2 + P^2$

Calculate the market equilibrium.

→   Answers. Click here!

Answers *Microeconomics* and mathematics
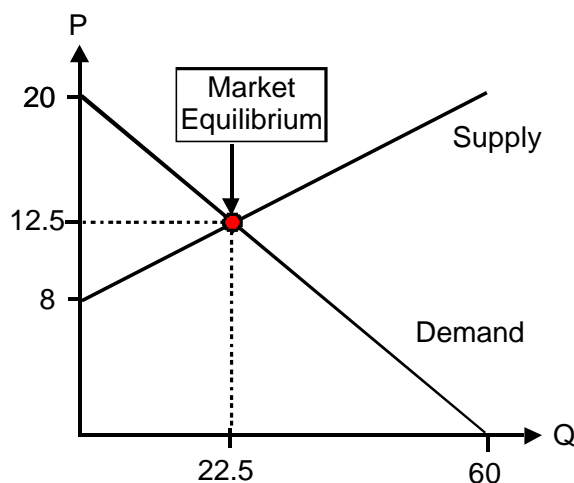
1   Markets, demand and supply

1.1

1.11   Price 6, quantity demanded: 60 - 3*6 = **42**
Price 2.5, quantity demanded: 60 - 3*2.5 = **52.5**

1.12   Price 12, quantity supplied: - 40 + 60 = **20**
Price 16.4, quantity supplied: - 40 + 5*16.4 = **42**

1.13   Market equilibrium if $Q_d = Q_s$
60 - 3P = - 40 + 5 P
- 8P = - 100
P = 12.5
Q = Q_d (= Q_s) = 60 - 3*12.5 = **22.5**

1.14 Q_d = 60 - 3P Q_s = - 40 + 5P
3P = 60 - Q_d - 5P = - 40 - Q_s
P = 20 - Q_d/3   5P = 40 + Q_s
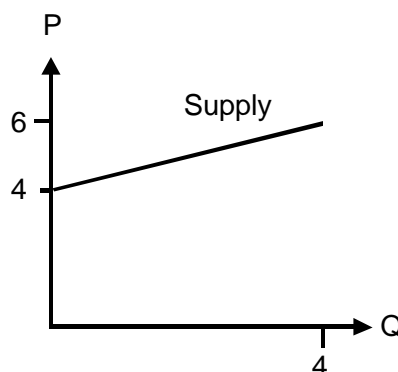   **P = 8 + Q_s/5**

1.15

1.2

Demand: P = 12 - 3Q_d
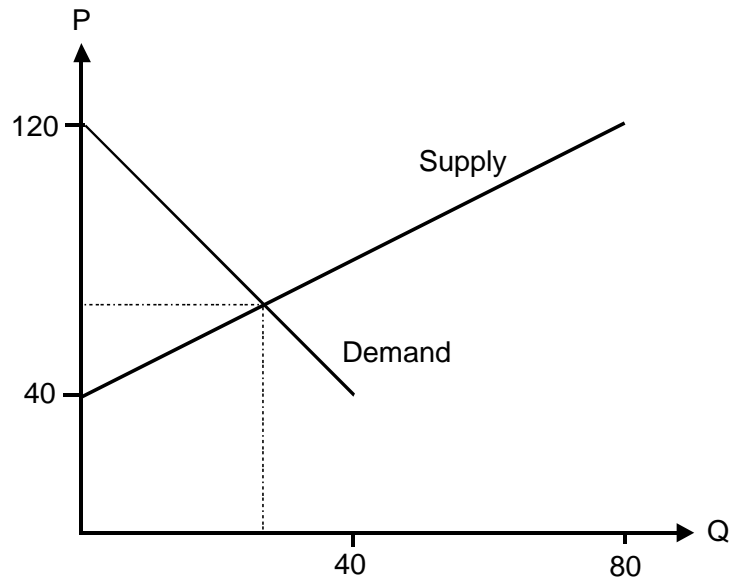Supply: P = 4 + Q_s

1.3

1.31 Supply: P = 4 + 0.5*Q

1.3 cont.	1.32	4 = y-intercept (y if x = 0) 0.5 = slope of the supply curve
1.4	1.41	Graph of the market:

$$P$$

120

Supply

Demand

40

40   80 Q

	1.42	Demand: $P = 120 - 2Q_d$ Supply: $P = 40 + Q_S$

1.43   Market equilibrium if $P_d = P_S$ and $Q_d = Q_S$
$120 - 2Q = 40 + Q$
$-3Q = -80$

$$\mathbf{Q} = 80/3 = \mathbf{26\frac{2}{3}}$$

$$\mathbf{P} = 120 - 2Q = 120 - 2*26\frac{2}{3} = \mathbf{66\frac{2}{3}}$$

1.5   1.51   Market equilibrium:

- by factorization:
  $Q_d = Q_S$
  $8 - P = -4 + P^2$
  $-P^2 - P + 12 = 0$
  $-(P^2 + P - 12) = 0$
  $-(P + 4)(P - 3) = 0$
  $[P_1 = -4]$ [no solution because $P < 0$]
  $\mathbf{P_2 = 3}$ [because if $P = 3 \rightarrow (3 - 3) = 0$]
  $Q_d = 8 - P = 8 - 3 = 5$ $\rightarrow \mathbf{Q = 5}$

- by formula:
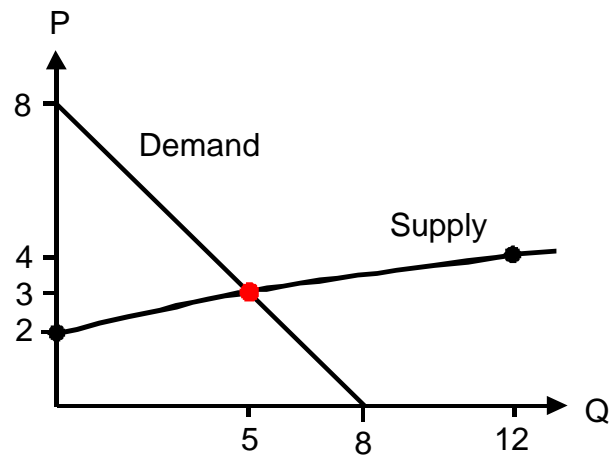
$$P_1 , P_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{1 \pm \sqrt{1^2 + 48}}{-2}$$

$$[P_1 = \frac{1 + \sqrt{1^2 + 48}}{-2} = -4]$$

$$\mathbf{P_2} = \frac{1 - \sqrt{1^2 + 48}}{-2} = \mathbf{3} \qquad \mathbf{Q} = 8 - P = 8 - 3 = \mathbf{5}$$

1.5	1.52 Sketch of the market:

1.6	Market equilibrium:

- by factorization:

$Q_d = Q_s$

$8 - 3P = -2 + P^2$

$-P^2 - 3P + 10 = 0$

$-(P^2 + 3P - 10) = 0$

$-(P + 5)(P - 2) = 0$

$[P_1 = -5]$ [no solution because P < 0]

$\mathbf{P_2 = 2}$ [because if P = 2 → (2 - 2) = 0]

$Q_d = 8 - 3P = 8 - 6 = 2$ → **Q = 2**

- by formula:

$$P_1 , P_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{3 \pm \sqrt{3^2 + 40}}{-2}$$

$$\left[P_1 = \frac{3 + \sqrt{3^2 + 40}}{-2} = -5\right]$$

$$\mathbf{P_2 = \frac{3 - \sqrt{3^2 + 40}}{-2} = 2} \qquad \mathbf{Q = 2}$$

→ Back to questions. Click here!