The law of demand: If the price of good x decrease then the quantity demanded increases

increase $\uparrow$
decrease $\downarrow$
price p
commodity $x = q$

If $p \downarrow \Rightarrow q \uparrow$
If $p \uparrow \Rightarrow q \downarrow$

If the price of good x increases then the quantity demanded decreases

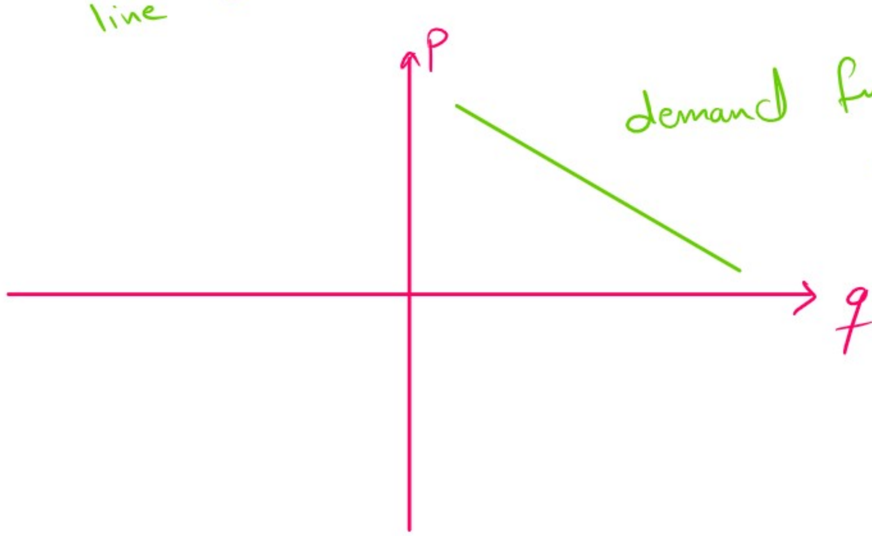
Demand function

$$\boxed{p = cq + d}$$

line

c, d numbers
slope $= c < 0$

demand function negative slop



The law of Supply: The quantity supplied for sale $\uparrow$

if the price of product $\uparrow$

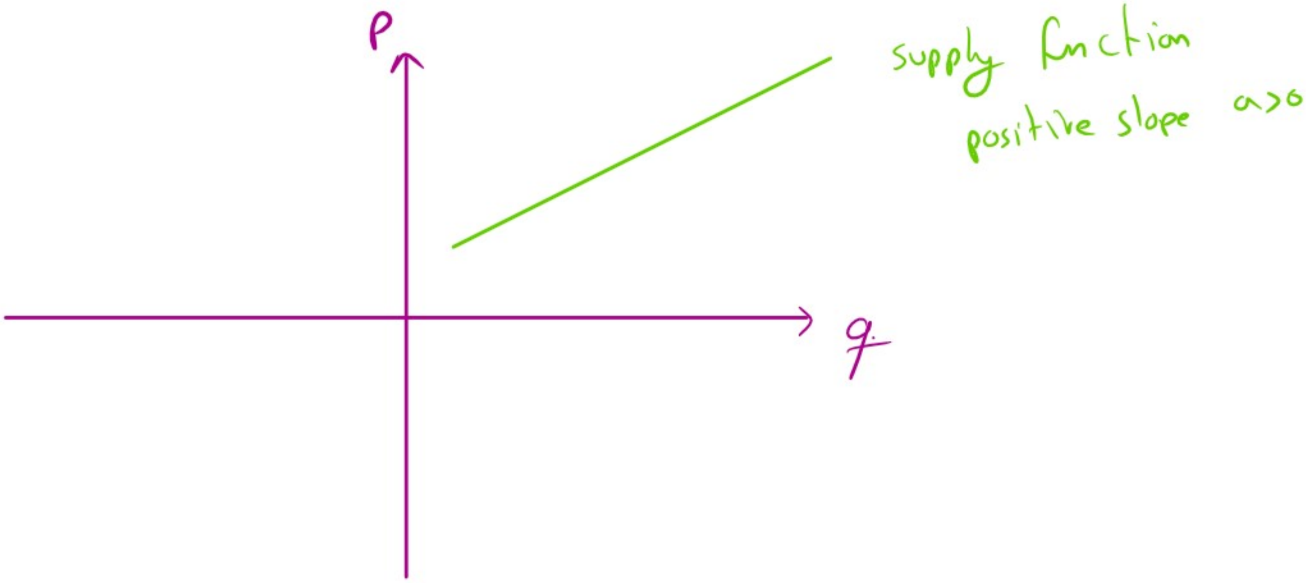
if the price of product ↑

The quantity supplied for sale ↓
if the price of product ↓

Supply function

line ← $\boxed{p = aq + b}$ → slope $= a > 0$

a, b numbers



Def : Market Equilibrium (M. Eq.)

occurs when quantity demanded for a commodity equals to the quantity supplied

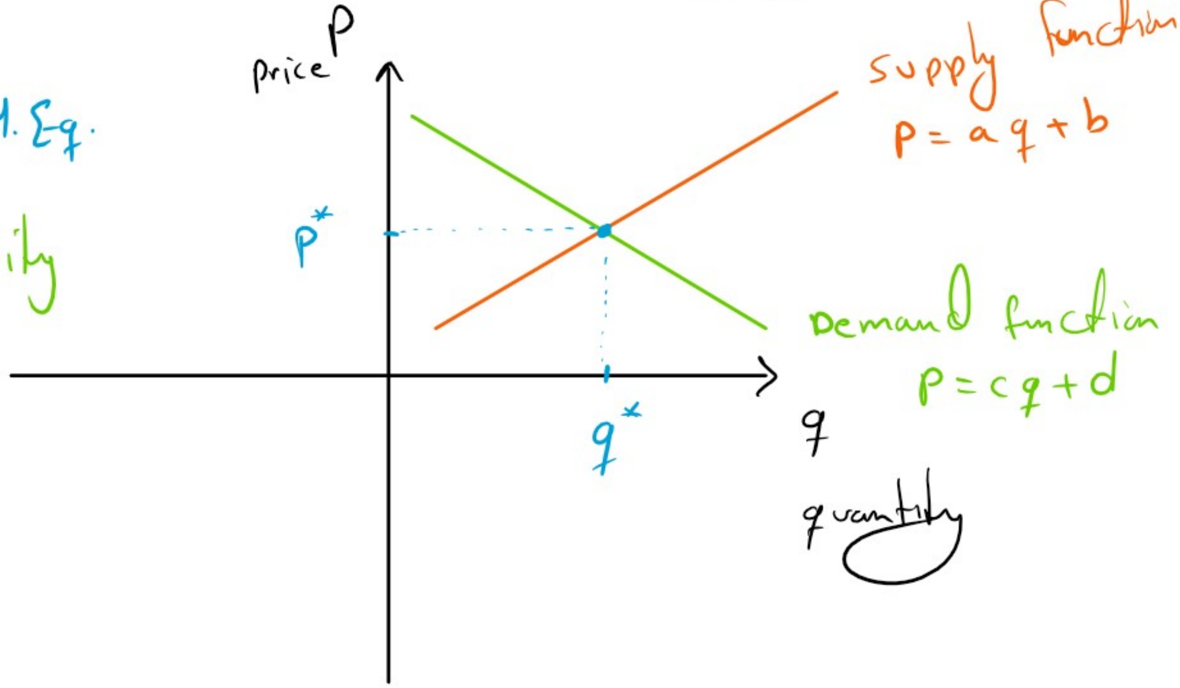
Demand = Supply

Demand = Supply

(q^*, p^*) is M. Eq.

q^*: Eq. quantity

p^* = Eq. price



<u>Exp</u> A group of wholesalers will buy 50 dryers per month if price \$200

تجار جملة ‏ ‏ ‏ ‏ مجفف

〃 〃 〃 〃 〃 〃 = \$300

and they 〃 〃 30 〃 〃 〃 〃 〃

• The manufacture is willing to supply 20 dryers if the price \$210

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〃 〃 〃 〃 30 〃 〃 〃 = \$230

Assume Demand and Supply are linear function:

① Find Demand function

Demand function passes through the points (q, p):

$(\overset{q_0}{50}, \overset{p_0}{200})$ and $(\overset{q_1}{30}, \overset{p_1}{300})$

$y - y_0 = m(x - x_0)$

$y \to p$, $x \to q$

<u>line equation</u> $p - p_0 = m(q - q_0)$ | $m = \dfrac{\Delta p}{\Delta q}$

$p - 200 = -5(q - 50)$ | $= \dfrac{p_1 - p_0}{} = \dfrac{300 - 200}{}$

$$P - 200 = -5(q - 50)$$

$$P - \cancel{200} = -5q + 250$$

$$+\cancel{200} \qquad +200$$

demand function $\boxed{P = -5q + 450}$

$c = -5 < 0$ $\qquad$ $d = 450$

$$= \frac{P_1 - P_0}{q_1 - q_0} = \frac{300 - 200}{30 - 50}$$

$$= \frac{100}{-20}$$

$$= -5$$

② Find supply functions

supply function passes through the points

$$\overset{q_0}{(20}, \overset{P_0}{210)}, \overset{q_1}{(30}, \overset{P_1}{230)}$$

line equation $\qquad P - P_0 = m(q - q_0)$ $\quad$ where $m = \dfrac{\Delta P}{\Delta q}$

$$P - 210 = 2(q - 20)$$

$$P - \cancel{210} = 2q - 40$$

$$+\cancel{210} \qquad +210$$

supply function $\boxed{P = 2q + 170}$

$a = 2 > 0$ $\qquad$ $b = 170$

$$= \frac{P_1 - P_0}{q_1 - q_0}$$

$$= \frac{230 - 210}{30 - 20}$$

$$= \frac{20}{10}$$

$$= 2$$

③ Find M. Eq.

Demand = Supply

Demand = Supply

$$-5q + 450 = 2q + 170$$

$$+5q \qquad +5q$$

$$450 = 7q + 170$$

$$-170 \qquad -170$$

$$\frac{280}{7} = \frac{7q}{7} \Rightarrow \boxed{q^* = 40}$$

yes → Demand, supply

Eq. quantity

supply

$$p^* = 2q^* + 170$$

$$= 2(40) + 170$$

$$= 80 + 170$$

$$\boxed{p^* = 250}$$

Eq. price

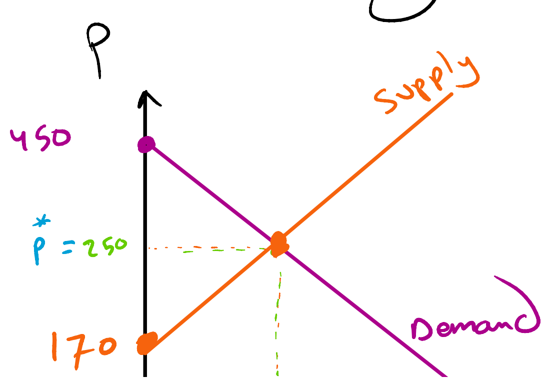
③ Graph the M. Eq. together with demand and supply functions

supply function

$p = 2q + 170$

$q = 0 \Rightarrow p = 170$

$q^* = 40 \Rightarrow p^* = 250$



Demand function

$p = -5q + 450$

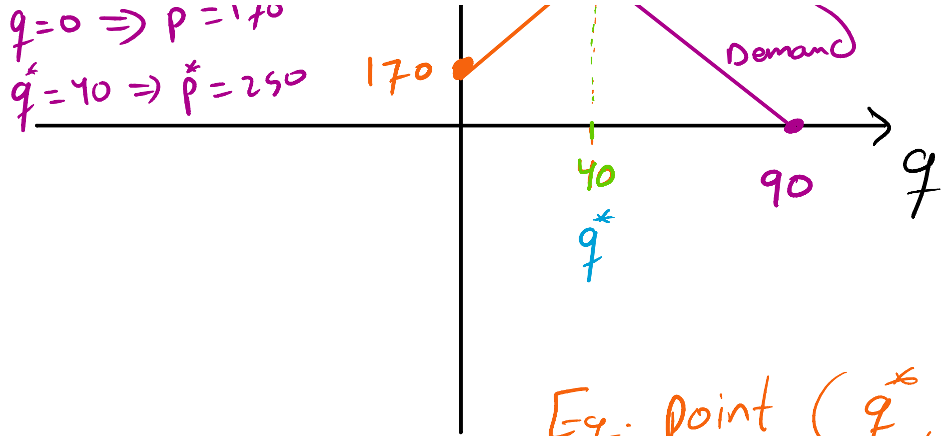
p-intercept (0, 450)

$q = 0 \Rightarrow p = -5(0) + 450$

$p = 450$

$p = 0 \Rightarrow 0 = -5q + 450$

$5q = 450$



$5q = 450$

$q = 90$

q-intercept $(90, 0)$

Eq. point $(q^*, p^*) = (40, 250)$

Exp What is the effect of proposing tax K in \$ by the supplier on each unit sold?

- If the supplier imposes (يفرض) \$K on each unit sold, then this tax is passed to the consumer by adding \$K to the selling price of product
- That is, original supply $p = aq + b$

  new supply after adding K tax is $p = aq + b + K$

- Demand will not change since the value of product is not change

- Eq. quantity ↓

- Eq. price ↑

new supply after adding K tax

p

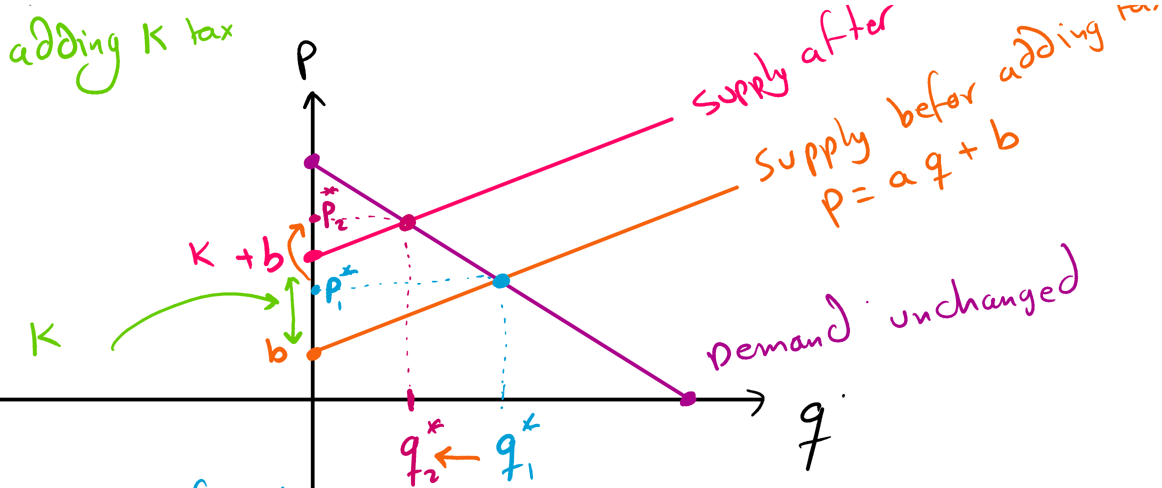
supply after taxing

(or adding tax

new supply after adding K tax

$p = aq + b + K$

$q = 0 \Rightarrow p = b + K$



(q_1^*, p_1^*) is M. Eq. befor tax

(q_2^*, p_2^*) " " " after tax

$\Rightarrow$ Eq. quantity $\downarrow$

Eq. price $\uparrow$

Exp Given the following demand and supply functions

Demand : $\quad p = -3q + 36$

Supply : $\quad p = 4q + 1$

① Find M. Eq.

Demand = Supply $\Rightarrow$ $-3q + 36 = 4q + 1$

$\quad +3q \qquad +3q$

$36 = 7q + 1$

$-1 \qquad -1$

$\frac{35}{7} = \frac{7q}{7}$

$\boxed{q_1^* = 5}$

Demmand $p^* = -3q^* + 36$

$= -3(5) + 36$

$= -15 + 36$

$\boxed{p_1^* = 21}$

M. Eq. Point is $(q^*, p^*) = (5, 21)$

$\boxed{q_1 = 5}$

M. Eq. point is $(q_1^*, p_1^*) = (5, 21)$

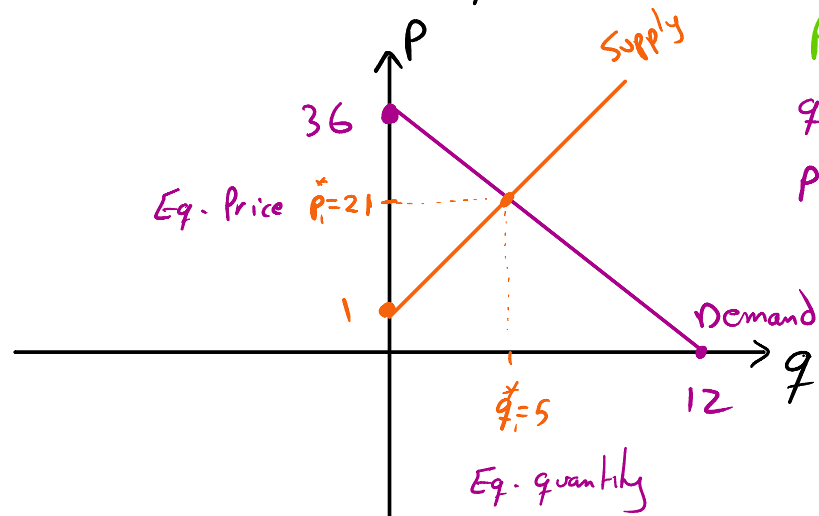
② Sketch Demand and Supply functions and determine the M. Eq.

supply function

$p = 4q + 1$

$q = 0 \Rightarrow p = 1$

$q_1^* = 5 \Rightarrow p_1^* = 21$



Demand function

$p = -3q + 36$

$q = 0 \Rightarrow p = 36$

$p = 0 \Rightarrow 3q = 36$

$\boxed{q = 12}$

③ Now suppose the supplier impose's tax \$7 per each unit sold. Find the new Eq. point. Stech

New supply

$p = 4q + 1 + 7$

$\boxed{p = 4q + 8}$

Demand unchanged $\boxed{p = -3q + 36}$

new supply

$p_2^* = 4q_2^* + 8$

Demand = New Supply

$\cancel{-3q} + 36 = 4q + 8$

$\cancel{+3q} \qquad +3q$

$36 = 7q + \cancel{8}$

$-8 \qquad \cancel{-8}$

$\frac{28}{7} = \frac{7q}{7}$

$\boxed{q^* = 4}$

$p_2 = 4q_2$

$= 4(4) + 8$

$= 16 + 8$

$\boxed{p_2^* = 24}$

$\boxed{q_2^* = 4}$

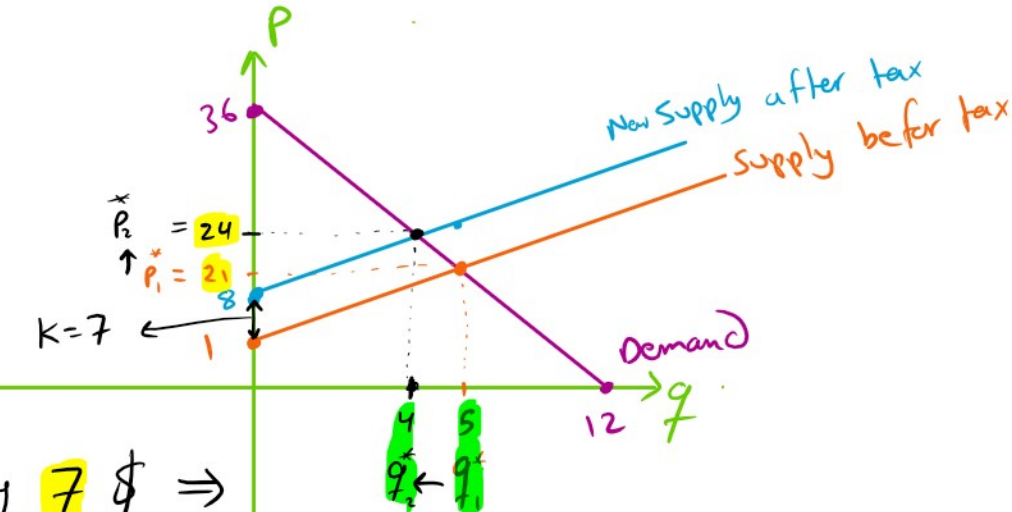
New Eq. point is $(q_2^*, p_2^*) = (4, 24)$

new supply

$p = 4q + 8$

$q = 0 \Rightarrow p = 8$

$q = 5 \Rightarrow p = 28$



As we impose tax by 7 \$ $\Rightarrow$

Eq. quantity $\downarrow$ by $5 - 4 = 1$ units

Eq. price $\uparrow$ by $24 - 21 = 3$ \$ per each unit.