

Q.1

For perpendicular line, $M_1 M_2 = -1$

M_1 for $-7x + 4y - 3 = 0$ is given by,

$$4y = 7x + 3$$

$$y = \frac{7}{4}x + \frac{3}{4}$$

$$M_1 = \frac{7}{4}$$

$$M_1 M_2 = -1$$

$$\frac{7}{4} \times M_2 = -1$$

$$M_2 = -\frac{4}{7}$$

For line 2, which passes $A(2, -4)$ and $M_2 = -\frac{4}{7}$

$$M_2 = \frac{\Delta y}{\Delta x} \quad \text{lets take a point } (x, y)$$

$$\frac{y - (-4)}{x - 2} = -\frac{4}{7}$$

$$7(y + 4) = -4(x - 2)$$

$$7y + 28 = -4x + 8$$

$$7y + 20 + 4x = 0$$

$$\Rightarrow y = -\frac{4}{7}x - \frac{20}{7}$$

$$(12) \quad p = S(x) = x^2 + x + 3 \text{ \$}$$

and

$$p = D(x) = 21 - 3x^2 \text{ \$}$$

(a) Supply = Demand $\Rightarrow$ Market equilibrium condition

$$x^2 + x + 3 = 21 - 3x^2$$

$$4x^2 + x - 18 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(4)(-18)}}{2(4)}$$

$$= \frac{-1 \pm 17}{8} \Rightarrow \frac{17-1}{8} = \frac{16}{8} = 2$$

$$\Rightarrow \frac{-1-1}{8} = \frac{-18}{8} \neq -2.25$$

x should be positive quantity = 2.

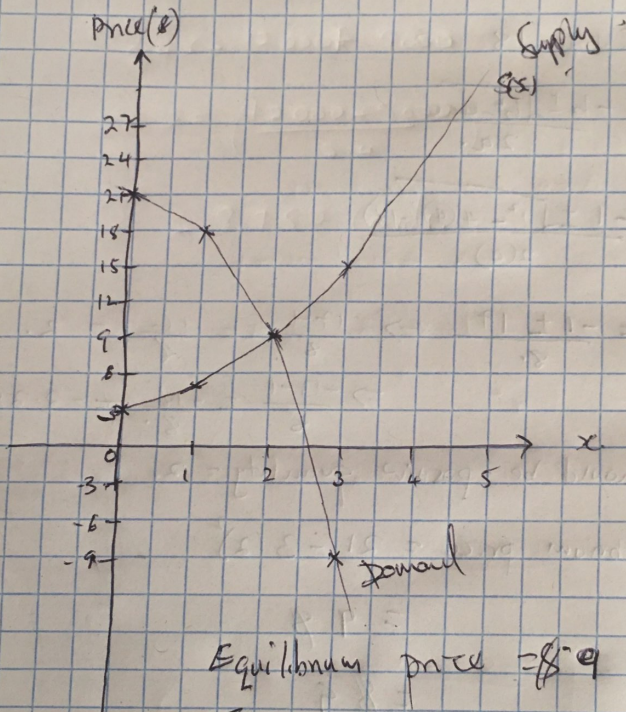
$$\text{Equilibrium price} = 21 - 3(2)^2$$

$$= 9 \text{ \$}$$

$$= \text{\$ } 9$$

(b)

x	P_s	P_d
0	3	21
1	5	18
2	9	9
3	15	-6



Equilibrium price = £9

Equilibrium quantity = 2 units.

(10)

For $x < 2$ ($0 < x < 2$) there will be a situation of Market Shortage as quantity demanded will be more than quantity supplied.

→ For $x > 2$, there will be a situation of Market surplus as quantity demanded will be less than quantity supplied.

Q3

each Card = \$2.75

Fixed overhead \$12000 ; variable cost of 35¢/unit

Total revenue function $R(x) = 2.75x$.

Cost per unit = \$0.35. Fixed cost = \$12,000

Cost function $C(x) = 12000 + 0.35x$.

$$\begin{aligned}\text{profit function } P(x) &= R(x) - C(x) \\ &= 2.75x - (12000 + 0.35x) \\ &= 2.4x - 12000\end{aligned}$$

$$\therefore P(x) = 2.4x - 12000$$

(b)

$$P(x) = 2.4x - 12000$$

To attain px of \$ 9000, $x = ?$

$$9000 = 2.4x - 12000$$

$$2.4x = 12000 + 9000$$

$$x = \left(\frac{12000 + 9000}{2.4} \right)$$

$$= 8.750 \text{ Cards.}$$