

M7 Homework.

6. Determine whether $(4, 0)$ is a soln to.

$$\begin{aligned} \textcircled{1} \quad 5x - y &= 4 \\ x + 6y &= 2 \end{aligned}$$

soln.

$$\begin{aligned} (5)(4) - (0) &= 4 \quad \text{false} \\ (4) + (6)(0) &= 2 \quad \text{false.} \end{aligned}$$

$$\begin{aligned} \text{ST. Cost} &= C(x) = 11x + 120 \\ \text{Revenue } R(x) &= 5x \end{aligned}$$

$$\text{At BEP} = C(x) = R(x)$$

$$11(x) + 120 = 5x$$

$$6x + 120 = 0$$

$$\frac{6x}{6} = \frac{-120}{6} \quad x = -20$$

* Kindly confirm the signs of the eqns if they are correct, the company never turns profit.

$$\begin{aligned} \text{ST. Cost } C(x) &= 64x + 20,000 \\ \text{Revenue } R(x) &= x^2 = 80x \end{aligned}$$

$$\Rightarrow y = 64x + 20,000 \quad \dots (1)$$

$$y = 80x \quad \dots (2)$$

$$\begin{aligned} (y - 64x &= 20,000) \\ y - 80x &= 0 \\ \hline 16x &= 20,000 \\ x &= 1,250 \end{aligned}$$

We substitute $x = 1250$

$$R(x) = 80x$$

$$R(x) = (80)(1250)$$

$$R(x) = 100,000$$

$$\text{In units} = \underline{\underline{1250 \text{ tickets}}}$$

Solve by substitution.

$$12. \quad 5x - 2y + 3z = 20$$

$$2x - 4y - 3z = -9$$

$$x + 6y - 8z = 21$$

soln.

$$x = 8z - 6y + 21$$

=

$$2(8z - 6y + 21) - 4y - 3z = -9$$

$$16z - 12y + 42 - 4y - 3z = -9$$

$$13z - 16y = -9 - 42$$

$$13z - 16y = -51 \quad \dots (1)$$

$$5(8z - 6y + 21) - 2y + 3z = 20$$

$$40z - 30y + 105 - 2y + 3z = 20$$

$$43z - 32y = 20 - 105$$

$$43z - 32y = -85 \quad \dots (11)$$

Using eqn (1) & (2) eliminate y.

$$\begin{aligned} (13z - 16y &= -51) \times 2 \\ (43z - 32y &= -85) \times 1 \end{aligned}$$

$$\begin{aligned} (26z - 32y &= -102) \\ (43z - 32y &= -85) \end{aligned}$$

$$-17z + 0 = -17$$

$$\frac{-17z}{-17} = \frac{-17}{-17}$$

$$z = 1$$

If $z=1$ we substitute.
using either of initial eqns.

$$\Rightarrow x+6y-8(1)=21$$

$$x+6y=21+8$$

$$x+6y=29 \quad \text{--- (iii)}$$

$$2x-4y-3(1)=-9$$

$$2x-4y-3=-9$$

$$2x-4y=-9+3$$

$$2x-4y=-6 \quad \text{--- (iv)}$$

Using eqn (iii) & (iv)

$$\begin{pmatrix} x+6y=29 \\ 2x-4y=-6 \end{pmatrix} \times \begin{matrix} 2 \\ 1 \end{matrix} \text{ to eliminate } x$$

$$\begin{pmatrix} 2x+12y=58 \\ 2x-4y=-6 \end{pmatrix}$$

$$0 \quad \frac{16y}{16} = \frac{64}{16} \quad y=4.$$

$$\therefore x+6(4)-8(1)=21$$

$$x+24-8=21$$

$$x+16=21$$

$$x=21-16$$

$$x=5$$

$$\therefore x=5, y=4 \text{ and } z=1$$

(7) Cost function $C(x) = 3x^2 - 10x + 200$
Revenue function $R(x) = -2x^2 + 100x + 50$

Soln.

$$y = 3x^2 - 10x + 200$$

$$y = -2x^2 + 100x + 50$$

Substitute the expression $y = 3x^2 - 10x + 200$
from the 1st eqn. into the 2nd eqn to solve for x .

$$\Rightarrow 3x^2 - 10x + 200 = -2x^2 + 100x + 50$$

$$5x^2 - 110x + 150 = 0$$

$$x^2 - 22x + 30 = 0 \quad \text{--- Quadratic eqn.}$$

Use formula.

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

$$x = \frac{-(-22) \pm \sqrt{(-22)^2 - 4(1)(30)}}{2(1)}$$

$$x = \frac{22 \pm 2\sqrt{91}}{2} = 11 \pm \sqrt{91}$$

$$x_1 = 11 + \sqrt{91} \approx 21$$

$$x_2 = 11 - \sqrt{91} \approx 2$$

$\therefore$ The range π would be $2 \leq x \leq 21$