Business Problem

Sep 8 ...

$P = \underline{200}\ \$ \longrightarrow q = \underline{5000}$

$\longrightarrow$ P increases 1\$ $\longrightarrow$ q decreases 50

$C = 100000 \leftarrow$ fixed cost
$+$
$75q \leftarrow$ variable

y-int.

$y = mx + b$

slope

a) $q = q(P) = mP + b$

$m = -50$

$\underline{P = 201} \longrightarrow q = \underline{4950}$

$$\begin{cases} 5000 = m(200) + b \\ 4950 = m(201) + b \end{cases}$$

Subtraction

$-50 = m(1) \longrightarrow \boxed{m = -50}$

replace $m = -50$

$\hookrightarrow 5000 = -50(200) + b \rightarrow b = 15000$

$$\boxed{q = -50P + 15000}$$

b) $C = 100000 + 75q$

c) $R = \underbrace{P \cdot q} = P(-50P + 15000)$

$q = -50P + 15000 \rightarrow P = \dfrac{q - 15000}{-50}$

$\rightarrow P = \dfrac{-1}{50} q + 300$

$R = \left(\dfrac{-1}{50} q + 300\right) \cdot q = \dfrac{-1}{50} q^2 + 300q$

d)

break-even Points.

$C = R$

$75q + 100000 = \dfrac{-1}{50} q^2 + 300q$

$\dfrac{1}{50} q^2 + 75q - 300q + 100000 = 0$

$\dfrac{1}{50} q^2 - 225q + 100000 = 0$

$q = \dfrac{-(-225) \pm \sqrt{(-225)^2 - 4\left(\frac{1}{50}\right)(100000)}}{2\left(\frac{1}{50}\right)}$

quadratic Formula

$Ax^2 + Bx + C = 0$

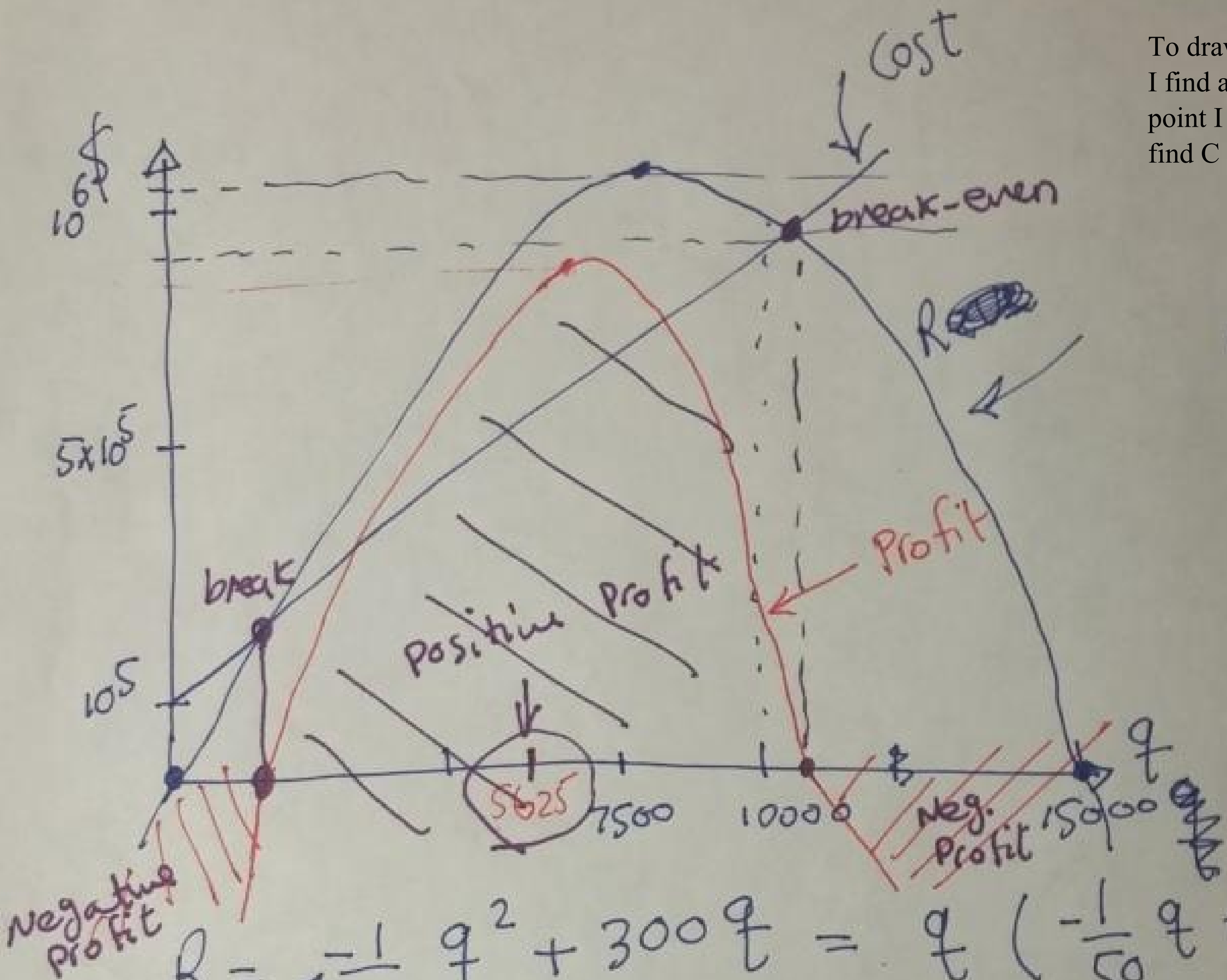
$x = \dfrac{-B \pm \sqrt{B^2 - 4AC}}{2A}$

$q = 5625 \pm 125\sqrt{1705}$ ⟶ $\dfrac{5625+125\sqrt{1705}+5625 - 125\sqrt{1705}}{2}$

$\simeq 463.5,\ 10786.45$

expensive Product Not selling too many

cheap Product selling alot



To draw the function of cost , I find a point on that line. The point I choose is at q=10000, I find C at this point

$q = 10000$

$\Downarrow$

$C = 100000 + 75(10000) = 850000$

$R = -\frac{1}{50}q^2 + 300q = q\left(-\frac{1}{50}q + 300\right)$

roots, $q=0$, $q = 15000$

$P = R - C = -\frac{1}{50}q^2 + 300q - (75q + 100000)$

$= -\frac{1}{50}q^2 + 225q - 100000$

$$P = \frac{-1}{50} q^2 + 225q - 100000$$

$$P' = \frac{-1}{50}(2q) + 225$$

$$= \frac{-1}{25} q + 225$$

$$P' = 0 \longrightarrow \frac{-1}{25} q + 225 = 0$$

In order to find the maximum, by first derivative test, we need to find the first derivative and set it zero. After finding this point, to confirm this point is maximum, we need to either use second derivative test, or determine how derivative is changing sign.

$$q = 225 / \tfrac{1}{25} = (225)(25) = 5625$$

Interest.

\$1000 $\quad r = 0.1$ Annually

1) Intest never converts to Principle

$1000(1 + 0.1) = 1100$ \$

$1000(1 + 0.1) + 1000(0.1) = 1200$ \$

2) Compoundeb Interest, Annually

$1000(1 + 0.1) = 1100$

$1100(1 + 0.1) = 1210$

$0.1(100) = 10$