Q (1) $D = 980 - 15P$

$$\frac{D}{15} = \frac{980}{15} - \frac{15P}{15}$$

$$\frac{D}{15} = \frac{980}{15} - P$$

$$P + \frac{D}{15} = \frac{980}{15}$$

$$P = \frac{980}{15} - \frac{1}{15}D$$

$\downarrow$ a $\quad$ $\downarrow$ b

(i) $D = \frac{a - C_V}{2b} = \frac{980/15 - 45}{2(1/15)}$

$$D = \frac{20.33}{0.133} = 152.4$$

(ii) Net Profit = ?

$= TR - C_T$

$= P \times D - C_F + C_V \times D$

$= \left(\frac{980}{15} - \frac{1}{15}D\right) \times 152.4 - 1800 + 45 \times 152.4$

$= -217$

$\Rightarrow$ Loss :((ii)

(iii) Profitable range ?

↳ use Quad formula

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

$$\Rightarrow (a - C_v)D - bD^2 - C_f = 0$$

b a c

$$= \frac{-(a - C_v) \pm \sqrt{(a - C_v)^2 - 4(-b)(C_f)}}{2b}$$

$$= \frac{-\left(\frac{980}{15} - 45\right) \pm \sqrt{\left(\frac{980}{15} - 45\right)^2 - 4\left(\frac{-1}{15}\right)(-1800)}}{2\left(\frac{1}{15}\right)}$$

But bro!
Profit hai? Nahi to!
So konsi range! (ini)

(iv) Products for max TR

$$= \frac{a}{2b} = \frac{980/15}{2/15}$$

$$= 490.$$

(2)

$TR = aD - bD^2$

$C_F = 1450$

$c_v = 5.5$

$a = 5.6$, $b = 0.0125$

(i) Maximum Profit = ?

↳ optimal

$$D = \frac{a - c_v}{2b} = \frac{5.6 - 5.5}{2(0.0125)}$$

$$D = \frac{0.1}{0.025} = 4$$

(ii) Max profit per month?

(a) $a - c_v > 0$

$5.6 - 5.5 > 0$ ✓

(b) $T_R > C_T$

$aD - bD^2 > C_F + c_v D$

$5.6 \times 4 - (0.0125 \times 4^2) > 1450 + 5.5 \times 4$

$22.4 - (0.2) > 1450 + 22$

$22.2 \not> 1472$

Thus no profit (ii)

(iii) No Profitable range

(iv) $TR_{max} = \frac{a^2}{4b} = \frac{(5.6)^2}{4 \times 0.0125}$

$= 627.2$

(3) (i) Profitable range?

$$D = \frac{-(a - c_v) \pm \sqrt{(a - c_v)^2 - 4(-b)(-c_F)}}{2(-b)}$$

Put values

$D_1 = 331500$

$D_2 = 158500$.

(ii) variable cost reduced by 10%

$15.57 \times 0.1 = 1.557$

$15.57 - 1.557 = 14.013$

Fixed cost reduced by 15%.

$= 1,000,000 \times \frac{15}{100} = 150000$

$= 850000$

Now again find D using quadratic formula.

$D_1 = 184250$

$D_2 = 229925$

so profitable area increased

(4) $D = 500 - 5P$

$$\frac{D}{5} = \frac{500}{5} - \frac{5P}{5}$$

$$P = 100 - \frac{1}{5}D$$

(i) $$D = \frac{a - Cv}{2b} = \frac{100 - 25}{2(1/5)} = \frac{75}{0.4}$$

$D = 187.5$

(ii) Max Profit $= TR - TC$

$= P \times D - C_F + C_v D$

$= 6931.25$

(iii) Range ?

Use quadratic formula

$$D = \frac{(-100 - 25) \pm \sqrt{(75)^2 - 4(0.2)(1000)}}{2(-0.2)}$$

$D_1 = 13.75$

$D_2 = 361.25.$