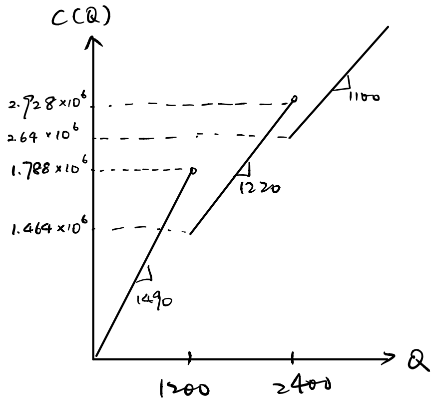
Problem 1

(a) All-units Discount.



$\lambda = 500, \quad K = 2250 \quad i = 6.85 \times 10^{-4}$

$$Q_2^* = \sqrt{\frac{2 \times 2250 \times 500}{6.85 \times 10^{-4} \times 1100}} = 1728.0$$

$$Q_1^* = \sqrt{\frac{2 \times 2250 \times 500}{6.85 \times 10^{-4} \times 1220}} = 1640.8 \quad \checkmark \text{ feasible.}$$

$$Q_0^* = \sqrt{\frac{2 \times 2250 \times 500}{6.85 \times 10^{-4} \times 1490}} = 1484.7$$

Only Q_1^* is realizable. and it has cost

$$1220 \times 500 + \sqrt{2250 \times 500 \times 6.85 \times 10^{-4} \times 1220} = 6.11 \times 10^5$$

$c\lambda + k\lambda\, iC$

$$g(Q) = \underbrace{C\lambda}_{\text{货物成本}} + \underbrace{\frac{k\lambda}{Q}}_{\text{购买成本}} + \underbrace{\frac{iCQ}{2}}_{\text{贮存成本}}$$

$h = iC$. 把h作为C的百分比

Next, we calculate the cost of breakpoints to the right of Q_1^*

$$g_2(2400) = 1100 \times 500 + \frac{2250 \times 500}{2400} + \frac{6.85 \times 10^{-4} \times 1100 \times 2400}{2} = 5.51 \times 10^5$$

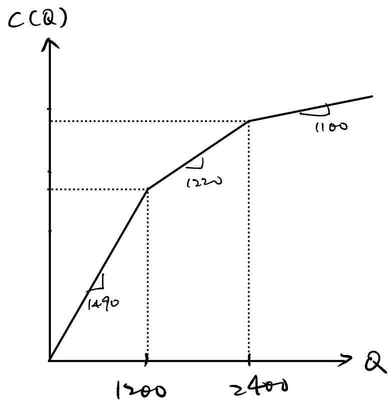
Total anual cost is

$$g_2(2400) \times 365 = 2.01 \times 10^8$$

Therefore, the optimal order quantity is $Q = 2400$,

the total cost is 201 M dollars.

(b) Incremental discount



$$\bar{C}_1 = 1490 \times 1200 - 1220 \times 1200 = 3.24 \times 10^5$$

$$\bar{C}_2 = 1490 \times 1200 + 1220 \times 1200 - 1100 \times 2400 = 6.12 \times 10^5$$

Next, we calculate Q_j^* for each j:

$$Q_0^* = \sqrt{\frac{2 \times (2250 + 0) \times 500 \times 365}{0.25 \times 1490}} = 1484.8$$

$$Q_1^* = \sqrt{\frac{2 \times (2250 + \bar{C}_1) \times 500 \times 365}{0.25 \times 1220}} = 19759.3$$

$$Q_2^* = \sqrt{\frac{2 \times (2250 + \bar{C}_2) \times 500 \times 365}{0.25 \times 1100}} = 28553.1 \quad \checkmark \text{ feasible.}$$

$$g(Q_2^*) = 1100 \times 500 \times 365 + \frac{0.25 \times 6.12 \times 10^5}{2} + \sqrt{2(2250 + 6.12 \times 10^5) \times 500 \times 365 \times 1100 \times 0.25}$$

$$= 208.7 \text{ M}$$