

考試科目	微積分	系所別	企業管理系乙組	考試時間	2月18日(一)第三節
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- Icybar sales ice cream for NT\$50 each ball. The average sales per day was 4,000 balls. When the price was raised to NT\$55 per ball, the average sales per day declined to an average of 3,500 balls. Assume that the demand equation is linear.
 - (10 points) Find the demand equation.
 - (10 points) Find the price (per ball) that will maximize the daily revenue.
 - (10 points) Find the elasticity of demand at a price of NT\$50.
 - (10 points) If Icybar has fixed costs of NT\$20,000 per day and the variable cost is NT\$8 per ball, find the price (per ball) that will maximize the daily profit.

- The owner of a Christmas store wants to determine the number of a certain Christmas ornament to be stocked for the upcoming Christmas season. The purchasing wholesale price is NT\$20 per item, and the selling price is NT\$50 per item. Any items not sold during this season will be sold for the nominal price of NT\$10 each (the *salvage value*). Let

q = order quantity,
 x = demand.

We have

$$\begin{aligned} \text{Profit} &= 50\min\{q, x\} - 20q + 10\max\{0, q - x\} \\ &= 50x - 50\max\{0, x - q\} - 20q + 10\max\{0, q - x\}. \end{aligned}$$

Assume that the demand has a probability distribution $f(x)$. So, the expected profit is

$$h(q) = \int_0^{\infty} [50x - 50(x - q)1_{\{x > q\}}(x) - 20q + 10(q - x)1_{\{x < q\}}(x)] f(x) dx.$$

- (15 points) Assume that

$$f(x) = \frac{1}{10000} e^{-x/10000}, \quad x > 0,$$

an exponential distribution with a mean of 10,000. Find the optimal order quantity that will maximize the expected profit.

- (15 points) (cont'd) Estimate the maximum expected profit.
- (15 points) (cont'd) Estimate the expected profit from ordering 10,000 items.

- (15 points) Find the minimum value of $x_1^2 + x_2^2 + x_3^2$ subject to $2x_1 + 2x_2 + x_3 + 9 = 0$.

備註

- 作答於試題上者，不予計分。
- 試題請隨卷繳交。