Minimizing Inventory Costs

Example:
A retail appliance store sells 2500 TV sets per year. It costs $10 to store one set for a year. To reorder, there is a fixed cost of $20 to cover administrative costs per order, plus $9 shipping fee for each set ordered.

a. How many times per year should the store reorder to minimize inventory costs?

Solution:
Let \( x \) = number of items per order

\[
\text{Yearly carrying cost} = 10 \cdot \frac{x}{2} = 5x
\]

\[
\text{Yearly reordering cost} = (20 + 9x) \cdot \frac{2500}{x} = \frac{50000}{x} + 22500
\]

\[
\text{Total Inventory Cost} = (\text{yearly carrying cost}) + (\text{yearly reordering cost})
\]

\[
y = (5x) + \left[ \frac{50000}{x} + 22500 \right]
\]

\[
y' = 5 - \frac{50000}{x^2}
\]

\[
y' = 0 \text{ when } \frac{5}{x^2} = 10000
\]

\[
x = 100
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\[
y'' = \frac{50000}{x^3} > 0 \text{ when } x = 100, \text{ so the minimum number of orders placed per year } = \frac{2500}{100} = 25 \text{ orders.}
\]

b. How many sets should be ordered each time?

Solution:
\( x = 100 \), so each order should contain 100 TV sets.