Advanced Techniques
6.2 – More Maximizing Applications

Ex A: Maximizing Tax Revenue

State Government Revenue

$t = tax\ rate$

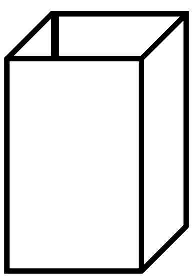
$S(t) = total\ sales\ in\ country$

$Government\ revenue = S(t) \cdot t$

A nerd predict that the relationship between the tax rate *t* on an item and the total sales *S* of that item (in millions of dollars) is $s(t) = 9 - 20\sqrt{t}$ for ($0 \leq t \leq 0.20$). Find the tax rate that maximizes revenue of the state government.

Ex B: Minimizing Package Materials

A moving company wishes to design an open-top box with a square base whose volume is exactly 32 cubic feet. Find the dimensions of the box requiring the least amount of materials.



Pro Tips

#1) Assign and define variables to each dimension of the box.

#2) Make equations for volume and surface area. Then use both of those equations to make a surface area function, *SA*.

#3) To minimize surface area, set $SA' = 0$ and solve. Make sure it is a min by using the second derivative test.

#4) Use *x* to answer the question asked.

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Ex C: Minimizing Cost

George wants to build a fence around his pet, Imagidragon. Imagidragon demands an area of 1000 square feet to frolic in the wind. The front and back of the dragon's play area will be a brick fence, priced at $20 per linear foot. The other two sides will be fenced with a cotton balls costing $1 per linear foot. Find the dimensions that will minimize the cost and find the minimum cost.

Pro Tips

#1) Assign and define variables to each dimension of the box.

#2) Make equations for area and cost. Then use both of those equations to make a cost function in one variable.

#3) To minimize cost, set $C(x)' = 0$ and solve. Make sure it is a min by using the second derivative test.

#4) Use *x* to answer the question asked.