

Solution

Math 181

Name:

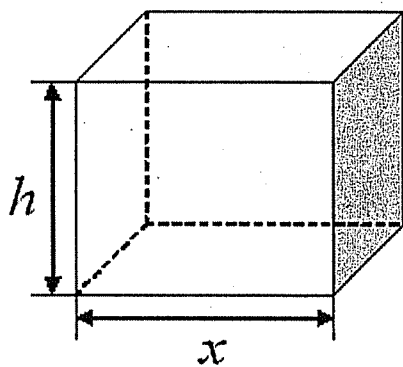
March 11, 2008

QUIZ # 8

REQUIREMENT: YOU NEED SHOW THE ALL DETAILS, FOLLOWING THE STANDARD PROCEDURE.

IF YOU JUST WRITE THE ANSWER DOWN, YOU WILL LOST MOST OF THE POINTS!!!

1. A rectangular box is made by a whole piece of steel whose total surface area is 432 m^2 . The box has open top and square base. What is the possible maximum volume? (10 points)



sol: Denote side length of base by x and height by h . so that the total surface is

$$A = x^2 + 4hx \quad \text{by taking into account that open top}$$

The volume is $V = x^2h$ so. ($x \neq 0$ is assumed)

$$V(x) = x^2 \cdot \frac{432 - x^2}{4x} = \frac{1}{4}(432x - x^3)$$

Then, to minimize V , the critical pts are:

i) stationary pts: $V' = 0 \Rightarrow x = 12$ and.

ii) ending pts: $x \neq 0$, also $x \neq 432$. so no ending pts.

iii) smoothness of $V(x)$ implies no singularity.

Note. $V'' = -6x \Big|_{x=12} < 0 \Rightarrow$ Concavity \Rightarrow maximum.

So max $V = 864$ while $x = 12, h = 6$.