

Calculus

Rates

Problem 1.- The volume of a cube increases at a rate of $10\text{cm}^3/\text{min}$. How fast is the surface area increasing when the length of an edge is 30cm ?

Solution:

The volume of a cube is the length of one side cubed

$$V = L^3$$

If we take derivative, to get the rate we have

$$\frac{dV}{dt} = 3L^2 \frac{dL}{dt}$$

If we put the numbers given in the problem

$$10 = 3(30)^2 \frac{dL}{dt}$$

The surface area is given

$$S = 6L^2$$

The derivative (the rate)

$$\frac{dS}{dt} = 12L \frac{dL}{dt} = 12(30) \frac{1}{270} = 1.33\text{cm}^2/\text{min}$$