

Given that the area of a circle $A \text{ cm}^2$ is related to its radius $r \text{ cm}$ by the formula $A = \pi r^2$, and that the rate of change of its radius in cm s^{-1} is given by $\frac{dr}{dt} = 5$, find $\frac{dA}{dt}$ when $r = 3$.

The volume of a hemisphere $V \text{ cm}^3$ is related to its radius $r \text{ cm}$ by the formula $V = \frac{2}{3}\pi r^3$ and the total surface area $S \text{ cm}^2$ is given by the formula $S = \pi r^2 + 2\pi r^2 = 3\pi r^2$. Given that the rate of increase of volume, in $\text{cm}^3 \text{ s}^{-1}$, $\frac{dV}{dt} = 6$, find the rate of increase of surface area $\frac{dS}{dt}$