Example

Find the rate of change of the volume $V$ of a sphere with respect to the radius $r$. What is the rate when $r = 5$?

Solution: A sphere of radius $r$ has volume

$$V = \frac{4}{3}\pi r^3.$$  

The rate of change of $V$ with respect to $r$ is the derivative

$$\frac{dV}{dr} = 4\pi r^2.$$  

When $r = 5$, the rate of change of $V$ with respect to $r$ is

$$\frac{dV}{dr} = 4\pi 5^2 = 100\pi.$$