Integrating a Function that only Depends on Distance from the Origin

Consider a scalar field $f = f(r)$ that depends only on the distance from the origin. Using $dx\,dy\,dz = r^2 \sin\theta\,dr\,d\theta\,d\phi$, and an integration region V inside a sphere of radius R centered at the origin, show that

$$\int_V f\,dV = 4\pi \int_0^R r^2 f(r)\,dr.$$

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