This is the Maxwell-Boltzmann velocity distribution. Technically, it's a joint probability density function of v_x, v_y, and v_z.

$$f(v_x, v_y, v_z) = \left(\frac{m}{2\pi kT}\right)^{3/2} \exp\left(-\frac{m(v_x^2 + v_y^2 + v_z^2)}{2kT}\right)$$

In spherical coordinates with $v = \sqrt{v_x^2 + v_y^2 + v_z^2}$ we have

$$f(v, \theta, \phi) = \left(\frac{m}{2\pi kT}\right)^{3/2} \exp\left(-\frac{mv^2}{2kT}\right)$$

By integrating over θ and ϕ we obtain Maxwell's speed distribution, also a probability density function.

$$f(v) = 4\pi \left(\frac{m}{2\pi kT}\right)^{3/2} v^2 \exp\left(-\frac{mv^2}{2kT}\right)$$

Noting that

$$dv_x\, dv_y\, dv_z = v^2 \sin\theta\, dv\, d\theta\, d\phi$$

and

$$\int_0^\pi \sin\theta\, d\theta = \cos(0) - \cos(\pi) = 2$$

the integral can be done by inspection.

$$f(v) = \int_0^{2\pi} \int_0^\pi f(v, \theta, \phi)\, v^2 \sin\theta\, d\theta\, d\phi = 4\pi v^2 f(v, \theta, \phi)$$