

The Fourier transform of  $f(\vec{x})$  in three dimensions can be defined as:

$$F(\vec{k}) = \sqrt{\frac{1}{2\pi}} \int_V f(\vec{x}) e^{-i\vec{k}\cdot\vec{x}} dV, \quad (1)$$

where  $\vec{k}$  and  $\vec{x}$  are vectors in 3D.

Assuming  $f(\vec{x})$  only depends on  $r$ , obtain  $F(\vec{k})$  as an integral in terms of  $f(r)$  and  $r$ , where  $r$  is the radial variable in spherical coordinates.