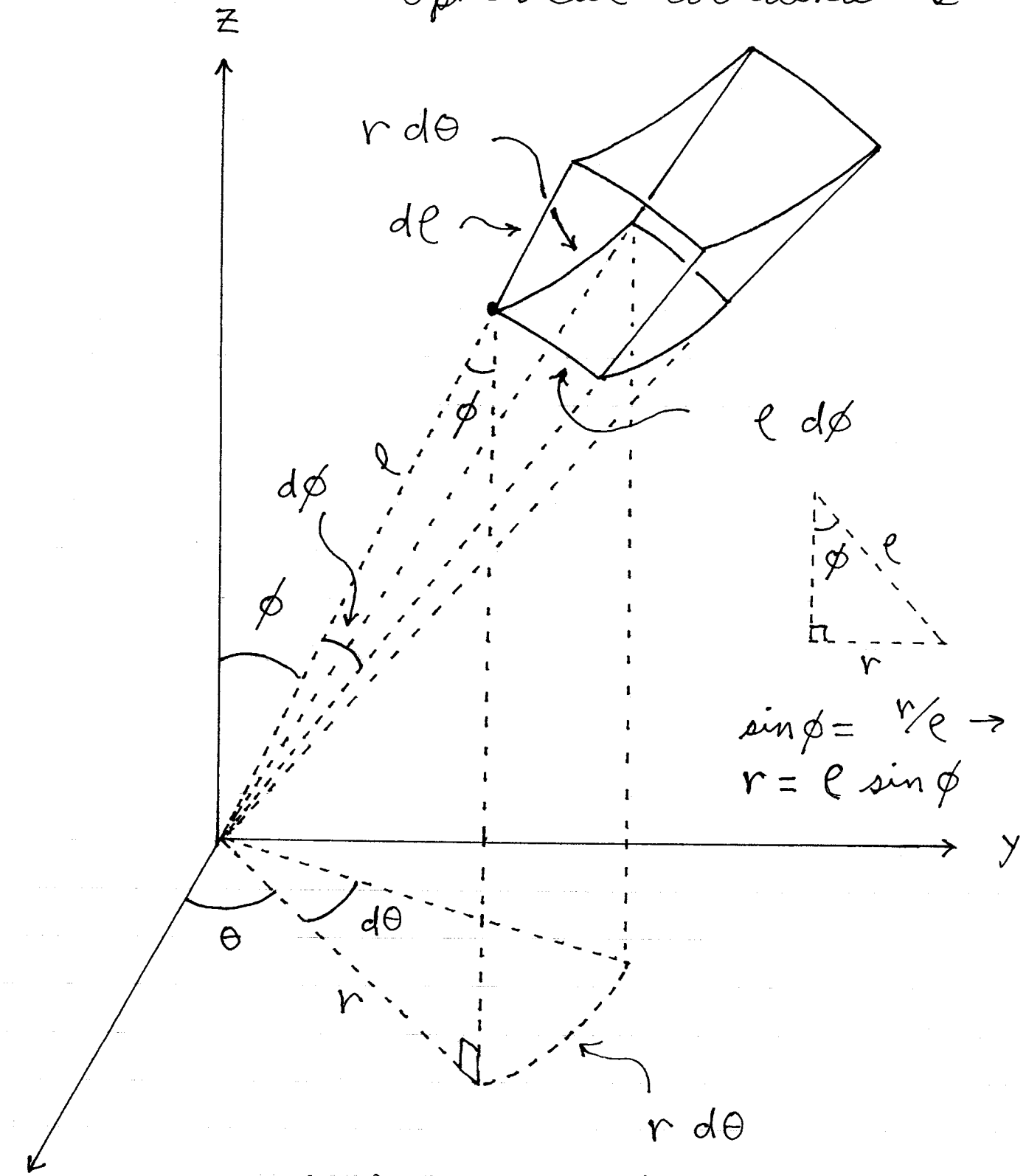
Math 21C
Kouba

The Differential of Volume for Spherical Coordinates



$$dV = (d\ell)(\ell\, d\phi)(r\, d\theta)$$
$$= (d\ell)(\ell\, d\phi)(\ell \sin\phi\, d\theta)$$
$$= \ell^2 \sin\phi\, d\ell\, d\phi\, d\theta$$