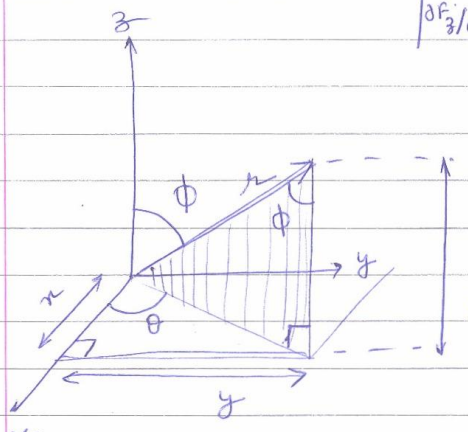
$T(x,y,z) \rightarrow (r,\theta,\phi)$

then $dx\,dy\,dz \rightarrow |J(T)|\,dr\,d\theta\,d\phi$

where, $J(T) = \begin{vmatrix} \partial f_x/\partial r & \partial f_x/\partial \theta & \partial f_x/\partial \phi \\ \partial f_y/\partial r & \partial f_y/\partial \theta & \partial f_y/\partial \phi \\ \partial f_z/\partial r & \partial f_z/\partial \theta & \partial f_z/\partial \phi \end{vmatrix}$



from figure

$x = r\sin\phi\cos\theta$

$y = r\sin\phi\sin\theta$

$z = r\cos\phi$

thus, $J(T) = \begin{vmatrix} \frac{\partial}{\partial r} r\sin\phi\cos\theta & \frac{\partial}{\partial\theta} r\sin\phi\cos\theta & \frac{\partial}{\partial\phi} r\sin\phi\cos\theta \\ \frac{\partial}{\partial r} r\sin\phi\sin\theta & \frac{\partial}{\partial\theta} r\sin\phi\sin\theta & \frac{\partial}{\partial\phi} r\sin\phi\sin\theta \\ \frac{\partial}{\partial r} r\cos\phi & \frac{\partial}{\partial\theta} r\cos\phi & \frac{\partial}{\partial\phi} r\cos\phi \end{vmatrix}$

$= \begin{vmatrix} \sin\phi\cos\theta & -r\sin\phi\sin\theta & r\cos\phi\cos\theta \\ \sin\phi\sin\theta & r\sin\phi\cos\theta & r\cos\phi\sin\theta \\ \cos\phi & 0 & -r\sin\phi \end{vmatrix}$

$= r^2\sin\phi$

thus, $dx\,dy\,dz \Rightarrow r^2\sin\phi\,dr\,d\theta\,d\phi$