Formula Sheet for MA 242-011 Test III

WARNING: Some assembly required

Coordinate change for double integrals:

$$\iint_R f(x,y)\,dA = \iint_{\tilde{R}} f(x(u,v), y(u,v)) \left|\frac{\partial(x,y)}{\partial(u,v)}\right| du\,dv$$

$$\frac{\partial(x,y)}{\partial(u,v)} = \begin{vmatrix} x_u & x_v \\ y_u & y_v \end{vmatrix}, \text{ where we note } dA = \left|\frac{\partial(x,y)}{\partial(u,v)}\right| du\,dv$$

Coordinate change for triple integrals:

$$\iiint_B f(x,y,z)\,dV = \iiint_{\tilde{B}} f(x(u,v,w), y(u,v,w), z(u,v,w)) \left|\frac{\partial(x,y,z)}{\partial(u,v,w)}\right| du\,dv\,dw$$

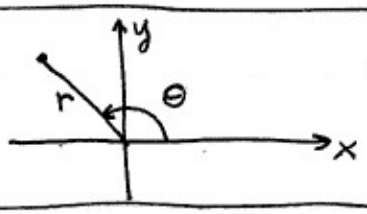
$$\frac{\partial(x,y,z)}{\partial(u,v,w)} = \begin{vmatrix} x_u & x_v & x_w \\ y_u & y_v & y_w \\ z_u & z_v & z_w \end{vmatrix}, \text{ where we note } dV = \left|\frac{\partial(x,y,z)}{\partial(u,v,w)}\right| du\,dv\,dw$$

polar coordinates:

$x = r\cos\theta$

$y = r\sin\theta$

$dA = r\,dr\,d\theta$



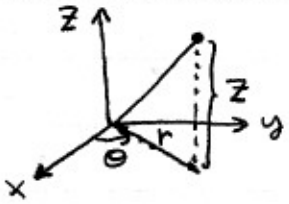
cylindrical coordinates:

$x = r\cos\theta$

$y = r\sin\theta$

$z = z$

$dV = r\,dr\,d\theta\,dz$



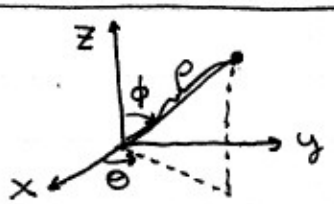
spherical coordinates:

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

$y = \rho\sin\theta\sin\phi$

$z = \rho\cos\phi$

$dV = \rho^2\sin\phi\,d\rho\,d\theta\,d\phi$



trigonometric identies:

$\sin^2\theta + \cos^2\theta = 1$

$\cos^2\theta = \frac{1}{2}(1 + \cos(2\theta))$