Useful Formulas—feel free to detach this page for easy reference.

Curves:

$$ds = \left|\frac{d\mathbf{r}}{dt}\right| dt \qquad \kappa = \frac{|\mathbf{v} \times \mathbf{a}|}{|\mathbf{v}|^3}$$

$$\kappa(x) = \frac{|f''(x)|}{\left(1 + (f'(x))^2\right)^{3/2}}$$

Volume and surface elements:

$$dV = dx\, dy\, dz \; = r\, dr\, d\theta\, dz = \rho^2 \sin\phi\, d\rho\, d\phi\, d\theta$$

$$dS = |\mathbf{r}_u \times \mathbf{r}_v|$$

$$dS = \sqrt{1 + \left(\tfrac{\partial z}{\partial x}\right)^2 + \left(\tfrac{\partial z}{\partial y}\right)^2}$$

$$dS = \frac{1}{g_z} \boldsymbol{\nabla} g$$

Integrals of odd powers of trig functions:

$$\int_0^{2\pi} \cos^{2n+1} t\, dt = \int_0^{2\pi} \sin^{2n+1} t\, dt = 0$$

for any positive integer n.