Dalhousie University
MATH 2002 - Formula Sheet

Trigonometric Identities

1. $\sin^2 x + \cos^2 x = 1$
2. $\sin^2 x = \dfrac{1 - \cos 2x}{2}$
3. $\cos^2 x = \dfrac{1 + \cos 2x}{2}$
4. $\sin 2x = 2 \sin x \cos x$
5. $\cos 2x = \cos^2 x - \sin^2 x$
   $= 2\cos^2 x - 1 = 1 - 2\sin^2 x$

Integration Formulas

1. $\displaystyle\int u \, dv = uv - \int v \, du$
2. $\displaystyle\int xe^x \, dx = xe^x - e^x + C$
3. $\displaystyle\int \ln x \, dx = x \ln x - x + C$
4. $\displaystyle\int x \sin x \, dx = -x \cos x + \sin x + C$
5. $\displaystyle\int x \cos x \, dx = x \sin x + \cos x + C$
6. $\displaystyle\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \arctan \frac{x}{a} + C$
7. $\displaystyle\int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin \frac{x}{a} + C$
8. $\displaystyle\int \sqrt{a^2 + x^2} \, dx = \frac{x}{2}\sqrt{a^2 + x^2} + \frac{a^2}{2} \ln(x + \sqrt{a^2 + x^2}) + C$
9. $\displaystyle\int \frac{dx}{\sqrt{a^2 + x^2}} = \ln(x + \sqrt{a^2 + x^2}) + C$
10. $\displaystyle\int_{-\infty}^{\infty} e^{-x^2} \, dx = \sqrt{\pi}$

Variation of Parameters

1. $c_1' y_1 + c_2' y_2 = 0$
2. $a(c_1' y_1' + c_2' y_2') = g(x).$

Cylindrical Coordinates

$x = r \cos \theta$
$y = r \sin \theta$
$z = z$
$dV = r \; dr \; d\theta \; dz$

Spherical Coordinates

$x = \rho \cos \theta \sin \varphi$
$y = \rho \sin \theta \sin \varphi$
$z = \rho \cos \varphi$
$dV = \rho^2 \sin \varphi \; d\rho \; d\varphi \; d\theta$