

Differentiation Formulas

4.3.105 $\frac{d}{dz} \sin z = \cos z$

4.3.106 $\frac{d}{dz} \cos z = -\sin z$

4.3.107 $\frac{d}{dz} \tan z = \sec^2 z$

4.3.108 $\frac{d}{dz} \csc z = -\csc z \cot z$

4.3.109 $\frac{d}{dz} \sec z = \sec z \tan z$

4.3.110 $\frac{d}{dz} \cot z = -\csc^2 z$

4.3.111 $\frac{d^n}{dz^n} \sin z = \sin\left(z + \frac{1}{2}n\pi\right)$

4.3.112 $\frac{d^n}{dz^n} \cos z = \cos\left(z + \frac{1}{2}n\pi\right)$

Integration Formulas

4.3.113 $\int \sin z \, dz = -\cos z$

4.3.114 $\int \cos z \, dz = \sin z$

4.3.115 $\int \tan z \, dz = -\ln \cos z = \ln \sec z$

4.3.116 $\int \csc z \, dz = \ln \tan \frac{z}{2} = \ln (\csc z - \cot z) = \frac{1}{2} \ln \frac{1 - \cos z}{1 + \cos z}$

4.3.117 $\int \sec z \, dz = \ln (\sec z + \tan z) = \ln \tan\left(\frac{\pi}{4} + \frac{z}{2}\right) = \text{gd}^{-1}(z)$
 = Inverse Gudermannian Function

$\text{gd } z = 2 \arctan e^z - \frac{\pi}{2}$

4.3.118 $\int \cot z \, dz = \ln \sin z = -\ln \csc z$

4.3.119 $\int z^n \sin z \, dz = -z^n \cos z + n \int z^{n-1} \cos z \, dz$

4.3.120 $\int \frac{\sin z}{z^n} \, dz = \frac{-\sin z}{(n-1)z^{n-1}} + \frac{1}{n-1} \int \frac{\cos z}{z^{n-1}} \, dz \quad (n > 1)$

4.3.121 $\int \frac{z}{\sin^2 z} \, dz = -z \cot z + \ln \sin z$

4.3.122

$$\int \frac{z \, dz}{\sin^n z} = \frac{-z \cos z}{(n-1) \sin^{n-1} z} - \frac{1}{(n-1)(n-2) \sin^{n-2} z} + \frac{(n-2)}{(n-1)} \int \frac{z \, dz}{\sin^{n-2} z} \quad (n > 2)$$

4.3.123

$$\int z^n \cos z \, dz = z^n \sin z - n \int z^{n-1} \sin z \, dz$$

4.3.124

$$\int \frac{\cos z}{z^n} \, dz = -\frac{\cos z}{(n-1)z^{n-1}} - \frac{1}{n-1} \int \frac{\sin z}{z^{n-1}} \, dz \quad (n > 1)$$

4.3.125 $\int \frac{z}{\cos^2 z} \, dz = z \tan z + \ln \cos z$

4.3.126

$$\int \frac{z \, dz}{\cos^n z} = \frac{z \sin z}{(n-1) \cos^{n-1} z} - \frac{1}{(n-1)(n-2) \cos^{n-2} z} + \frac{(n-2)}{(n-1)} \int \frac{z \, dz}{\cos^{n-2} z} \quad (n > 2)$$

4.3.127

$$\int \sin^m z \cos^n z \, dz = \frac{\sin^{m+1} z \cos^{n-1} z}{m+n} + \frac{(n-1)}{(m+n)} \int \sin^m z \cos^{n-2} z \, dz = -\frac{\sin^{m-1} z \cos^{n+1} z}{m+n} + \frac{(m-1)}{(m+n)} \int \sin^{m-2} z \cos^n z \, dz \quad (m \neq -n)$$

4.3.128

$$\int \frac{dz}{\sin^m z \cos^n z} = \frac{1}{(n-1) \sin^{m-1} z \cos^{n-1} z} + \frac{m+n-2}{n-1} \int \frac{dz}{\sin^m z \cos^{n-2} z} = \frac{-1}{(m-1) \sin^{m-1} z \cos^{n-1} z} + \frac{m+n-2}{m-1} \int \frac{dz}{\sin^{m-2} z \cos^n z} \quad (n > 1)$$

4.3.129 $\int \tan^n z \, dz = \frac{\tan^{n-1} z}{n-1} - \int \tan^{n-2} z \, dz \quad (n \neq 1)$

4.3.130 $\int \cot^n z \, dz = -\frac{\cot^{n-1} z}{n-1} - \int \cot^{n-2} z \, dz \quad (n \neq 1)$