Trigonometric Identities

$$\begin{aligned}
\sin^2 x + \cos^2 x &= 1 \\
\tan^2 x + 1 &= \sec^2 x \\
\cot^2 x + 1 &= \csc^2 x \\
\sin^2(x) &= \frac{1 - \cos(2x)}{2} \\
\cos^2(x) &= \frac{1 + \cos(2x)}{2} \\
\sin(2x) &= 2 \sin x \cos x \\
\sin x \sin y &= \frac{1}{2}[\cos(x - y) - \cos(x + y)] \\
\cos x \cos y &= \frac{1}{2}[\cos(x - y) + \cos(x + y)] \\
\sin x \cos y &= \frac{1}{2}[\sin(x - y) - \sin(x + y)]
\end{aligned}$$

Simpsons Rule and Trapezoidal Rule

$$\begin{aligned}
S_n &= \frac{\Delta x}{3}(f(x_0) + 4f(x_1) + 2f(x_2) + \cdots + 2f(x_{n-2}) + 4f(x_{n-1}) + f(x_n)) \\
T_n &= \frac{\Delta x}{2}(f(x_0) + 2f(x_1) + \cdots + 2f(x_{n-1}) + f(x_n))
\end{aligned}$$

Error estimates for Simpson's Rule and the Trapezoidal Rule

$$\begin{aligned}
|E_S| &\leq \frac{K(b-a)^5}{180n^4} \text{ where } |f^{(4)}(x)| \leq K \text{ on } [a,b] \\
|E_T| &\leq \frac{K(b-a)^3}{12n^2} \text{ where } |f''(x)| \leq K \text{ on } [a,b]
\end{aligned}$$

Antiderivatives

$$\begin{aligned}
\int \tan x \; dx &= \ln|\sec x| + C \\
\int \cot x \; dx &= \ln|\sin x| + C \\
\int \sec x \; dx &= \ln|\sec x + \tan x| + C \\
\int \csc x \; dx &= -\ln|\csc x + \cot x| + C
\end{aligned}$$