Handy Integrals of Trigonometric Functions

$$\begin{aligned}
\int \cos(ax)\ dx &= \frac{1}{a}\sin(ax) + C \\
\int x\cos(ax)\ dx &= \frac{1}{a}x\sin(ax) + \frac{1}{a^2}\cos(ax) + C \\
\int x^2\cos(ax)\ dx &= \frac{1}{a}x^2\sin(ax) + \frac{2}{a^2}x\cos(ax) - \frac{2}{a^3}\sin(ax) + C
\end{aligned}$$

$$\begin{aligned}
\int \sin(ax)\ dx &= -\frac{1}{a}\cos(ax) + C \\
\int x\sin(ax)\ dx &= -\frac{1}{a}x\cos(ax) + \frac{1}{a^2}\sin(ax) + C \\
\int x^2\sin(ax)\ dx &= -\frac{1}{a}x^2\cos(ax) + \frac{2}{a^2}x\sin(ax) + \frac{2}{a^3}\cos(ax) + C
\end{aligned}$$

$$\begin{aligned}
\int \sin(ax)\sin(bx)\ dx &= \int \frac{1}{2}\left(-\cos[(a+b)x] + \cos[(a-b)x]\right)\ dx \\
\int \cos(ax)\cos(bx)\ dx &= \int \frac{1}{2}\left(\cos[(a+b)x] + \cos[(a-b)x]\right)\ dx \\
\int \sin(ax)\cos(bx)\ dx &= \int \frac{1}{2}\left(\sin[(a+b)x] + \sin[(a-b)x]\right)\ dx
\end{aligned}$$

$$\begin{aligned}
\int_0^L \sin(n\pi x/L)\sin(m\pi x/L)\ dx &= \begin{cases} 0 & n \neq m \\ L/2 & n = m \end{cases} \\
\int_0^L \cos(n\pi x/L)\cos(m\pi x/L)\ dx &= \begin{cases} 0 & n \neq m \\ L/2 & n = m \end{cases} \\
\int_0^L \sin(n\pi x/L)\cos(m\pi x/L)\ dx &= \begin{cases} \frac{2nL}{\pi(n^2-m^2)} & n \neq m, n+m-\text{ odd} \\ 0 & n \neq m, n+m-\text{ even} \\ 0 & n = m \end{cases}
\end{aligned}$$