Useful Trigonometric Functional Relations and Integral Formula

$\sin (a+b) = \sin a \cos b + \cos a \sin b$
$\cos (a+b) = \cos a \cos b - \sin a \sin b$
$\cos^2 a + \sin^2 a = 1$
$\sin^2 a = (1/2)[1 - \cos 2a]$
$\cos^2 a = (1/2)[1 + \cos 2a]$

$\sinh (a+b) = \sinh a \cosh b + \cosh a \sinh b$
$\cosh (a+b) = \cosh a \cosh b + \sinh a \sinh b$
$\cosh^2 a - \sinh^2 a = 1$
$\sinh^2 a = (1/2)[\cosh 2a - 1]$
$\cosh^2 a = (112)[\cosh 2a + 1]$

$\sin (n\pi) = 0$, (n is integer)
$\cos (n\pi) = (-1)^n$
$\sin (n-1/2)\pi = (-1)^{n+1}$
$\cos (n-1/2)\pi = 0$
$\sin (n\pi/2) = (1/2)[1-(-1)^n](-1)^{(n-1)/2} = -\sin(3n\pi/2)$
$\cos (n\pi/2) = (1/2)[1+(-1)^n\}(-1)^{n/2} = \cos(3n\pi/2)$

$\int \sin(nx)dx = -(1/n)\cos(nx)$, $(n \neq 0)$
$\int \cos(nx)dx = (1/n)\sin(nx)$, $(n \neq 0)$

$$\int_0^1 \sin n\pi x dx = [1-(-1)^n]/n\pi$$

$$\int_0^1 \cos n\pi x dx = 0$$

$\int x\sin(nx)dx = (1/n^2)\sin(nx)-(x/n)\cos(nx)$
$\int x\cos(nx)dx = (x/n)\sin(nx)+(1/n^2)\cos(nx)$

$\int x^2\sin(nx)dx = (2x/n^2)\sin(nx)+(2/n^3-x^2/n)\cos(nx)$
$\int x^2\cos(nx)dx = (x^2/n-2/n^3)\sin(nx)+(2x/n^2)\cos(nx)$

$\int x^3\sin(nx)dx = (3x^2/n^2-6/n^4)\sin(nx)+(6x/n^3-x^3/n)\cos(nx)$
$\int x^3\cos(nx)dx = (x^3/n-6x/n^3)\sin(nx)+(3x^2/n^2-6/n^4)\cos(nx)$

$\int e^{ax}\sin(nx)dx = e^{ax}[a \sin(nx)-n \cos(nx)]/(a^2+n^2)$
$\int e^{ax}\cos(nx)dx = e^{ax}[a \cos(nx)-n \sin(nx)]/(a^2+n^2)$