

Integral Formulas

$$\begin{aligned}\int e^{ax} \sin(bx) dx &= \frac{1}{a^2 + b^2} e^{ax} (a \sin(bx) - b \cos(bx)) + C \\ \int e^{ax} \cos(bx) dx &= \frac{1}{a^2 + b^2} e^{ax} (a \cos(bx) + b \sin(bx)) + C \\ \int \sin(ax) \cos(bx) dx &= \frac{b \sin(ax) \sin(bx) + a \cos(ax) \cos(bx)}{b^2 - a^2} + C \\ \int \sin(ax) \sin(bx) dx &= \frac{b \sin(ax) \cos(bx) - a \cos(ax) \sin(bx)}{a^2 - b^2} + C \\ \int \cos(ax) \cos(bx) dx &= \frac{a \sin(ax) \cos(bx) - b \cos(ax) \sin(bx)}{a^2 - b^2} + C \\ \int x e^{ax} dx &= \frac{1}{a^2} (ax - 1) e^{ax} + C \\ \int x^2 e^{ax} dx &= \frac{1}{a^3} (a^2 x^2 - 2ax + 2) e^{ax} + C \\ \int x^3 e^{ax} dx &= \frac{1}{a^4} (a^3 x^3 - 3a^2 x^2 + 6ax - 6) e^{ax} + C\end{aligned}$$

Laplace Transformation Formulas

$$\begin{aligned}\mathbb{L}\{y'\} &= s\mathbb{L}\{y\} - y(0) \\ \mathbb{L}\{y''\} &= s^2\mathbb{L}\{y\} - sy(0) - y'(0) \\ \mathbb{L}\{1\} &= \frac{1}{s} \\ \mathbb{L}\{t^n\} &= \frac{n!}{s^{n+1}} \\ \mathbb{L}\{e^{at}\} &= \frac{1}{s - a} \\ \mathbb{L}\{\sin(bt)\} &= \frac{b}{s^2 + b^2} \\ \mathbb{L}\{\cos(bt)\} &= \frac{s}{s^2 + b^2} \\ \mathbb{L}\{\delta(t - a)\} &= e^{-as} \\ \mathbb{L}\{u(t - a)\} &= \frac{e^{-as}}{s} \\ \mathbb{L}\{f(t - a)u(t - a)\} &= e^{-as}\mathbb{L}\{f\}\end{aligned}$$

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