

Laplace Transform: brief survey

$$\mathcal{L}\{e^{\alpha t}\} = \frac{1}{p-\alpha}$$

$$\mathcal{L}\{\sin(\omega t)\} = \frac{\omega}{p^2+\omega^2}$$

$$\mathcal{L}\{1\} = \frac{1}{p}$$

$$\mathcal{L}\{t^n\} = \frac{n!}{p^{n+1}}$$

$$\mathcal{L}\{\cos(\omega t)\} = \frac{p}{p^2+\omega^2}$$

$$\mathcal{L}\{t\} = \frac{1}{p^2}$$

$$\mathcal{L}\{af(t) + bg(t)\} = a\mathcal{L}\{f(t)\} + b\mathcal{L}\{g(t)\}$$

$$\mathcal{L}^{-1}\{aF(p) + bG(p)\} = a\mathcal{L}^{-1}\{F(p)\} + b\mathcal{L}^{-1}\{G(p)\}$$

$$\mathcal{L}\{f(t) \cdot H(t-a)\} = e^{-ap}\mathcal{L}\{f(t+a)\}$$

$$\mathcal{L}^{-1}\{e^{-ap}F(p)\} = \mathcal{L}^{-1}\{F(p)\}\big|_{t-a} \cdot H(t-a)$$

$$\mathcal{L}\{e^{at}f(t)\} = \mathcal{L}\{f\}\big|_{p-a}$$

$$\mathcal{L}^{-1}\{F(p-a)\} = e^{at}\mathcal{L}^{-1}\{F(p)\}$$

$$\mathcal{L}\{f(at)\} = \frac{1}{a}\mathcal{L}\{f\}\big|_{p/a}$$

$$\mathcal{L}^{-1}\{F(ap)\} = \frac{1}{a}\mathcal{L}^{-1}\{F(p)\}\big|_{t/a}$$

$$\mathcal{L}\{f'(t)\} = p\mathcal{L}\{f(t)\} - f(0^+)$$

$$\mathcal{L}\{f''(t)\} = p^2\mathcal{L}\{f(t)\} - pf(0^+) - f'(0^+)$$

$$\mathcal{L}\{tf(t)\} = -\frac{d}{dp}\mathcal{L}\{f(t)\}$$

$$\mathcal{L}\left\{\frac{1}{t}f(t)\right\} = \int_p^\infty \mathcal{L}\{f(t)\}(q) dq$$

$$\mathcal{L}\left\{\int_0^t f(u) du\right\} = \frac{1}{p}\mathcal{L}\{f(t)\}$$

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$$\sin(\omega t) \hat{=} \frac{\omega}{p^2+\omega^2}$$

$$1 \hat{=} \frac{1}{p}$$

$$t^n \hat{=} \frac{n!}{p^{n+1}}$$

$$\cos(\omega t) \hat{=} \frac{p}{p^2+\omega^2}$$

$$t \hat{=} \frac{1}{p^2}$$

$$af(t) + bg(t) \hat{=} aF(p) + bG(p)$$

$$aF(p) + bG(p) \hat{=} af(t) + bg(t)$$

$$\mathcal{L}\{f(t) \cdot H(t-a)\} = e^{-ap}\mathcal{L}\{f(t+a)\}$$

$$\mathcal{L}^{-1}\{e^{-ap}F(p)\} = \mathcal{L}^{-1}\{F(p)\}\big|_{t-a} \cdot H(t-a)$$

$$e^{at}f(t) \hat{=} F(p)\big|_{p-a}$$

$$F(p-a) \hat{=} e^{at}f(t)$$

$$f(at) \hat{=} \frac{1}{a}F(p)\big|_{p/a}$$

$$F(ap) \hat{=} \frac{1}{a}f(t)\big|_{t/a}$$

$$f'(t) \hat{=} pF(p) - f(0^+)$$

$$f''(t) \hat{=} p^2F(p) - pf(0^+) - f'(0^+)$$

$$tf(t) \hat{=} -[F(p)]'$$

$$\frac{1}{t}f(t) \hat{=} \int_p^\infty F(q) dq$$

$$\int_0^t f(u) du \hat{=} \frac{1}{p}F(p)$$