

Common Laplace Transforms

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

$$4. \mathcal{L}\{\cos kt\} = \frac{s}{s^2 + k^2}$$

$$2. \mathcal{L}\{e^{at}\} = \frac{1}{s-a}$$

$$5. \mathcal{L}\{\sinh kt\} = \frac{k}{s^2 - k^2}$$

$$3. \mathcal{L}\{\sin kt\} = \frac{k}{s^2 + k^2}$$

$$6. \mathcal{L}\{\cosh kt\} = \frac{s}{s^2 - k^2}$$

$$7. \mathcal{L}\{y^{(n)}\} = s^n Y - s^{n-1}y(0) - s^{n-2}y'(0) - \dots - sy^{(n-2)}y(0) - y^{(n-1)}(0)$$

$$8. \mathcal{L}\{e^{at}f(t)\} = F(s-a)$$

$$9. \mathcal{L}\{\mathcal{U}(t-a)\} = \frac{e^{-as}}{s}$$

$$10. \mathcal{L}\{f(t-a)\mathcal{U}(t-a)\} = e^{-as}F(s)$$

$$11. \mathcal{L}\{g(t)\mathcal{U}(t-a)\} = e^{-as}\mathcal{L}\{g(t+a)\}$$

$$12. \mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}[F(s)]$$

$$13. \mathcal{L}\{f(t) * g(t)\} = F(s)G(s)$$

$$14. \mathcal{L}\left\{\int_0^t f(\tau)g(t-\tau)d\tau\right\} = F(s)G(s)$$

$$15. \mathcal{L}\left\{\int_0^t f(\tau)d\tau\right\} = \frac{F(s)}{s}$$

$$16. \mathcal{L}\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st}f(t)dt, \text{ where } f(t) \text{ has period } T$$

$$17. \mathcal{L}\{\delta(t)\} = 1$$

$$18. \mathcal{L}\{\delta(t-t_0)\} = e^{-st_0}$$

$$19. \mathcal{L}\{f(t)\} = \int_0^\infty e^{-st}f(t)dt$$