

Derivatives

1. $\frac{d}{dx} [f(u) \cdot g(u)] = [f'(u) \cdot g(u) + f(u) \cdot g'(u)] \cdot u'$
2. $\frac{d}{dx} \frac{f(u)}{g(u)} = \frac{f'(u) \cdot g(u) - f(u) \cdot g'(u)}{[g(u)]^2} \cdot u'$
3. $\frac{d}{dx} [u^n] = n u^{n-1} \cdot u'$
4. $\frac{d}{dx} [\ln u] = \frac{1}{u} \cdot u'$
5. $\frac{d}{dx} [\log_a u] = \frac{1}{u \ln a} \cdot u'$
6. $\frac{d}{dx} [e^u] = [e^u] \cdot u'$
7. $\frac{d}{dx} [a^u] = [a^u \ln a] \cdot u'$
8. $\frac{d}{dx} [\sin u] = [\cos u] \cdot u'$
9. $\frac{d}{dx} [\cos u] = [-\sin u] \cdot u'$
10. $\frac{d}{dx} [\tan u] = [\sec^2 u] \cdot u'$
11. $\frac{d}{dx} [\cot u] = [-\csc^2 u] \cdot u'$
12. $\frac{d}{dx} [\sec u] = [\sec u \tan u] \cdot u'$
13. $\frac{d}{dx} [\csc u] = [-\csc u \cot u] \cdot u'$
14. $\frac{d}{dx} [\arcsin u] = \frac{1}{\sqrt{1-u^2}} \cdot u'$
15. $\frac{d}{dx} [\arccos u] = \frac{-1}{\sqrt{1-u^2}} \cdot u'$
16. $\frac{d}{dx} [\arctan u] = \frac{1}{1+u^2} \cdot u'$
17. $\frac{d}{dx} [\text{arccot } u] = \frac{-1}{1+u^2} \cdot u'$
18. $\frac{d}{dx} [\text{arcsec } u] = \frac{1}{|u| \sqrt{u^2-1}} \cdot u'$
19. $\frac{d}{dx} [\text{arccsc } u] = \frac{-1}{|u| \sqrt{u^2-1}} \cdot u'$

Integrals

1. $\int u^a \, du = \frac{u^{a+1}}{a+1} + C$

[T1 Td (17.)T] +745 79.566 cm 0.393f 9.974 Tf 99.963 T /T1_2 9 0 0 m 27.33 0 I S Q BT

Laplace Transforms

1. $L\{f(t)g(t)\} = F(s)G(s)$
2. $L\{af(t) + bg(t)\} = aF(s) + bG(s)$
3. $L\{f^{(n)}(t)\} = s^n F(s) - f^{(n-1)}(0)$
4. $L\{f^{(n)}(t)\} = s^n F(s) - sf^{(n-1)}(0) - f^{(n-2)}(0)$
5. $L\{f^{(n)}(t)\} = s^n F(s) - s^{n-1}f(0) - f^{(n-1)}(0)$
6. $L\left\{\int_0^t f(\tau)g(t-\tau)d\tau\right\} = \frac{F(s)G(s)}{s}$
7. $L\{e^{at}f(t)\} = F(s-a)$
8. $L\{u_a(t)f(t-a)\} = e^{-as}F(s)$
9. $L\left\{\int_0^t f(\tau)g(t-\tau)d\tau\right\} = F(s)G(s)$
10. $L\{tf(t)\} = -F'(s)$
11. $L\{t^n f(t)\} = (-1)^n F^{(n)}(s)$
12. $L\left\{\frac{f(t)}{t}\right\} = \int_s^\infty F(\tau)d\tau$
13. $L\{f(t), \text{period } p\} = \frac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t) dt$
14. $L\{1\} = \frac{1}{s}$
15. $L\{t\} = \frac{1}{s^2}$
16. $L\{t^n\} = \frac{n!}{s^{n+1}}$
17. $L\left\{\frac{1}{t}\right\} = \int_s^\infty \frac{1}{\tau} d\tau$
18. $L\{t^a\} = \frac{\Gamma(a+1)}{s^{a+1}}$
19. $L\{e^{at}\} = \frac{1}{s-a}$
20. $L\{t^n e^{at}\} = \frac{n!}{(s-a)^{n+1}}$
21. $L\{\cos kt\} = \frac{s}{s^2 + k^2}$
22. $L\{\sin kt\} = \frac{k}{s^2 + k^2}$
23. $L\{\cosh kt\} = \frac{s}{s^2 - k^2}$
24. $L\{\sinh kt\} = \frac{k}{s^2 - k^2}$
25. $L\{e^{at} \cos kt\} = \frac{s-a}{(s-a)^2 + k^2}$
26. $L\{e^{at} \sin kt\} = \frac{k}{(s-a)^2 + k^2}$
27. $L\left\{\frac{1}{2k^3}(\sin kt - kt \cos kt)\right\} = \frac{1}{(s^2 + k^2)^2}$
28. $L\left\{\frac{t}{2k} \sin kt\right\} = \frac{s}{(s^2 + k^2)^2}$
29. $L\left\{\frac{1}{2k}(\sin kt + kt \cos kt)\right\} = \frac{s^2}{(s^2 + k^2)^2}$
30. $L\{u_a(t)\} = \frac{e^{-as}}{s}$
31. $L\{e^{-at}\} = \frac{1}{s+a}$
32. $L\{(1-t)^n \cdot [t=a] \text{ (square wave)}\} = \frac{1}{s^{n+1}}$