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Successive Differentiation of standard functions

- $D^n(e^{ax}) = a^n e^{ax}$
- $D^n(a^x) = a^x(\log_e x)^n$
- $D^n\{(ax+b)^m\} = \frac{m!\,(ax+b)^{m-n}a^n}{(m-n)!}$
- $D^n\{\log_e(ax+b)\} = (-1)^{n-1}(n-1)!\left(x+\frac{b}{a}\right)^{-n}$
- $D^n\left\{\frac{1}{(ax+b)^m}\right\} = \frac{(-1)^n(m+n-1)!\,a^n}{(m-1)!(ax+b)^{m+n}}$
- $D^n\{\sin(ax+b)\} = a^n \sin\left(ax+b+\frac{n\pi}{2}\right)$
- $D^n\{\cos(ax+b)\} = a^n \cos\left(ax+b+\frac{n\pi}{2}\right)$
- $D^n\{e^{ax}\sin(bx+c)\} = (a^2+b^2)^{\frac{n}{2}}\, e^{ax} \sin(bx+c+n\tan^{-1}\left({}^{b}/_{a}\right))$
- $D^n\{e^{ax}\cos(bx+c)\} = (a^2+b^2)^{\frac{n}{2}}\, e^{ax} \cos\,(bx+c+n\tan^{-1}\left({}^{b}/_{a}\right))$

Leibnitz Theorem for n-th derivative

Let u and v be any 2 continuous functions. Then according to Leibintz Theorem,

$$D^n(\,uv\,) = {}^nC_0D^n(u)v + {}^nC_1D^{n-1}(u)D(v) + {}^nC_2D^{n-2}(u)D^2(v) + \cdots + {}^nC_nu\,D^n(v)$$