* DUIS (Differentiation under Integral signs)

For one parameter

If $I(\alpha) = \int_a^b f(x,\alpha)\,dx$ then

$$I'(\alpha) = \int_a^b \frac{\partial}{\partial \alpha} f(x,\alpha)\,dx$$

* Leibnitz Rule:

If

$$I(\alpha) = \int_{\phi(\alpha)}^{\psi(\alpha)} f(x,\alpha)\,dx$$

then

$$I'(\alpha) = \int_{\phi(\alpha)}^{\psi(\alpha)} \frac{\partial}{\partial \alpha} f(x,\alpha)\,dx + f(\psi(\alpha),\alpha)\frac{d\psi}{d\alpha} - f(\phi(\alpha),\alpha)\cdot\frac{d\phi}{d\alpha}$$

* Error function

$$erf(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-v^2}\,dv$$

Complementary fun^n

$$erfc(x) = \frac{2}{\sqrt{\pi}} \int_x^\infty e^{-v^2}\,dv$$

properties:

1. $erf(\infty) = 1$
2. $erf(0) = 0$
3. $erf(x) + erfc(x) = 1$
4. $erf(x)$ is an odd function.