* 1.4.2 Mehrere Variable

$X_{1,2}$ mit Verteilungen $f_1(x_1), f_2(x_2) \Rightarrow \mu_{1,2}\,;\ \sigma^2_{1,2}$

betrachte $g(x_1,x_2) = \left.\frac{\partial g}{\partial x_1}\right|_{\mu_1}(x_1-\mu_1) + \left.\frac{\partial g}{\partial x_2}\right|_{\mu_2}(x_2-\mu_2)$

$-g(\mu_1,\mu_2)$

$$+\frac{1}{2!}\left(\sum_{i,j=1,2}\left.\frac{\partial^2 g}{\partial x_i \partial x_j}\right|_{\mu_i,\mu_j}(x_i-\mu_i)(x_j-\mu_2)\right)+\dots$$

$$\langle g(x_1,x_2)\rangle = g(\mu_1,\mu_2) + \frac{1}{2}\left.\frac{\partial^2 g}{\partial x_1^2}\right|_{\mu_1}\sigma_1^2 + \frac{1}{2}\left.\frac{\partial^2}{\partial x_2^2}\right|_{\mu_2}\sigma_2^2$$

(gemischte Terme jeden Null!) + höhere

mit $\langle g(x_1,x_2)\rangle = \int dx_1 f_1(x_1)\int dx_2 f_2(x_2)\, g(x_1,x_2)$

$$\langle (g(x_1,x_2)-\langle g(x_1,x_2)\rangle)^2\rangle \overset{\text{Ordnung }\sigma^2}{=}$$

$$\left\langle \left(\left.\frac{\partial g}{\partial x_1}\right|_{\mu_1}(x_1-\mu_1) + \left.\frac{\partial g}{\partial x_2}\right|_{\mu_2}(x_2-\mu_2)\right)^2\right\rangle$$

$$= \underbrace{\left(\left.\frac{\partial g}{\partial x_1}\right|_{\mu_1}\right)^2\sigma_1^2 + \left(\left.\frac{\partial g}{\partial x_2}\right|_{\mu_2}\right)^2\sigma_2^2}_{\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim} + 2\left.\frac{\partial g}{\partial x_1}\right|_{\mu_1}\left.\frac{\partial g}{\partial x_2}\right|_{\mu_2}\underbrace{\langle (x_1-\mu_1)(x_2-\mu_2)\rangle}_{=0!}$$

$$\sigma_g^2 = \left.\frac{\partial g}{\partial x_1}\right|_{\mu_1}\sigma_1^2 + \left.\frac{\partial g}{\partial x_2}\right|_{\mu_2}\sigma_2^2$$

$$\sigma_g = \sqrt{\quad\dots\quad}$$

(speziell $g(x_1,x_2) = x_1 + x_2$ ✓)