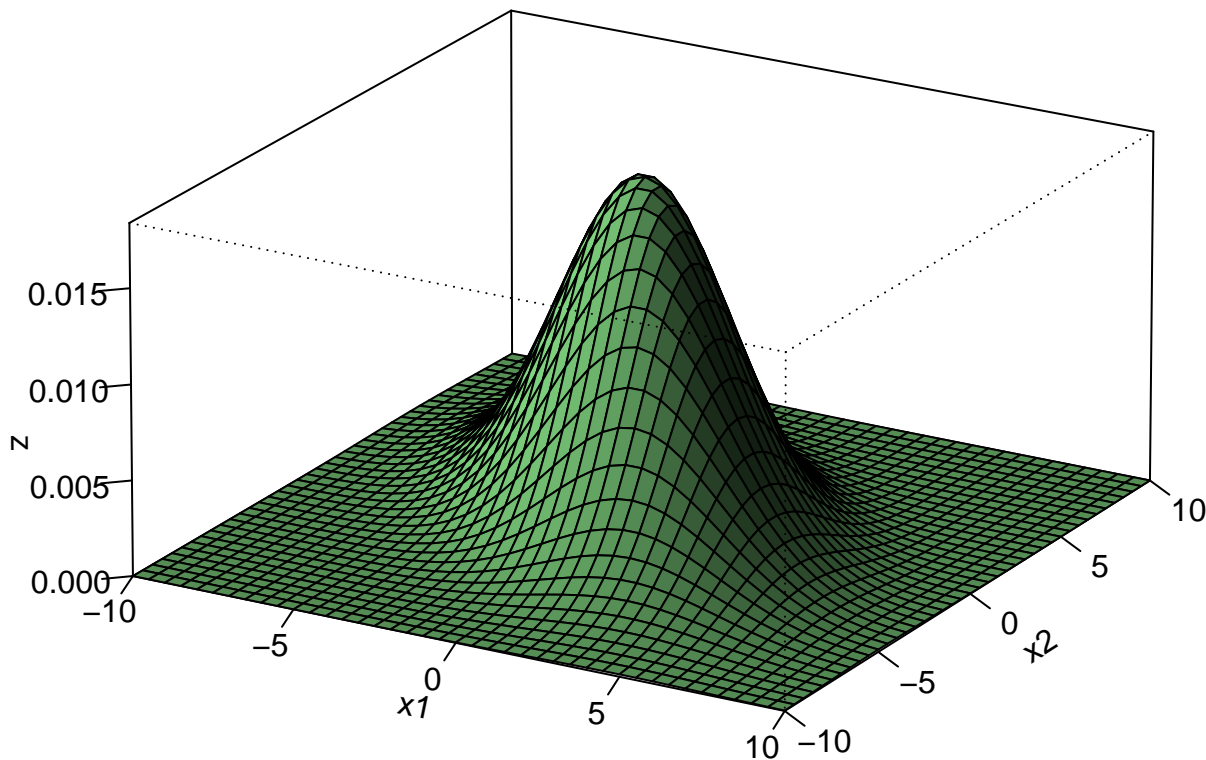# Two dimensional Normal Distribution

$\mu_1 = 0$, $\mu_2 = 0$, $\sigma_{11} = 10$, $\sigma_{22} = 10$, $\sigma_{12} = 15$, $\rho = 0.5$

$$f(\mathbf{x}) = \frac{1}{2\,\pi\,\sqrt{\sigma_{11}\,\sigma_{22}\,(1-\rho^2)}} \quad \exp\left\{-\frac{1}{2(1-\rho^2)}\left[\frac{(x_1-\mu_1)^2}{\sigma_{11}} - 2\,\rho\,\frac{x_1-\mu_1}{\sqrt{\sigma_{11}}}\frac{x_2-\mu_2}{\sqrt{\sigma_{22}}} + \frac{(x_2-\mu_2)^2}{\sigma_{22}}\right]\right\}$$