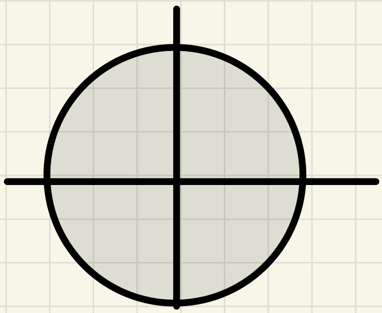
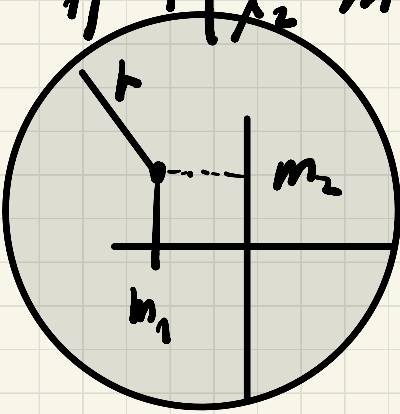
$$x_1^2 + x_2^2 \leq 1$$



$$(x_1 - m_1)^2 + (x_2 - m_2)^2 \leq r^2$$



Kreisscheibe mit Mittelpunk (m1_,m_2) mit Radius r

$$M = \{ (x_1, x_2) \in \mathbb{R}^2 \mid x_1^2 + \underbrace{x_2^2}_{\geq 0} \leq 1 \}$$

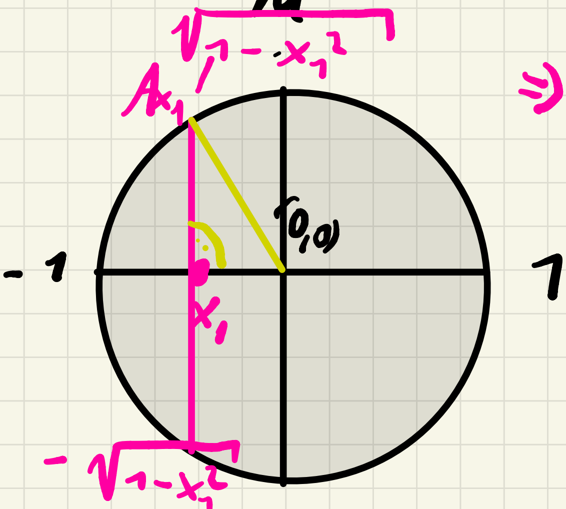
$$f(x) = 1$$

$$\int_M f \, d\mu = \int_M 1 \, d\gamma$$

$A_{x_1} \neq \emptyset$?

$|x_1| > 1 \Rightarrow A_{x_1} = \emptyset$

$\Rightarrow |x_1| \leq 1$



wähle $x_1 \in \mathbb{R}$

$$A_{x_1} := \{ x_2 \in \mathbb{R} \mid \underbrace{(x_1, x_2) \in M}_{x_1^2 + x_2^2 \leq 1} \}$$

$$|x_1| \le 1 \iff -1 \le x_1 \le 1$$

$$A_{x_1} := \{ x_2 \mid x_2^2 \le 1 - x_1^2 \}$$

$$\iff |x_2| \le \sqrt{1-x_2^2} \}$$

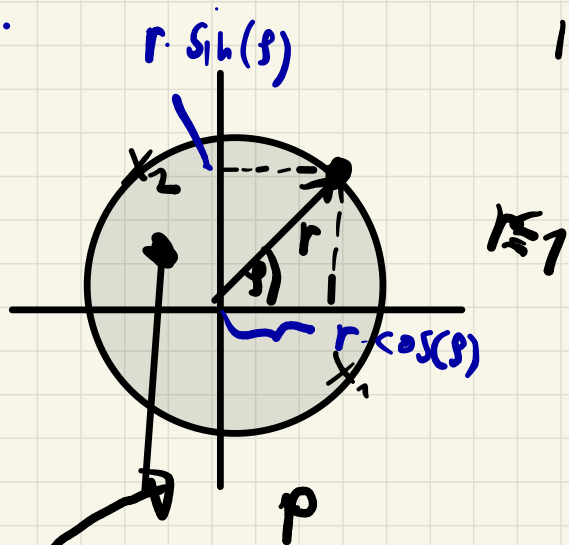
$$\int_M 1 \, dy \overset{\text{Fubini}}{=} \int_{-1}^{1} \int_{-\sqrt{1-x_1^2}}^{\sqrt{1-x_1}} 1 \, dx_2 \, dx_1$$

$$\int_{-1}^{1} \left[x_2 \right]_{-\sqrt{1-x_2}}^{\sqrt{1-x_2^2}} dx_1 = 2 \cdot \underbrace{\int_{-1}^{1} \sqrt{1-x^2} \, dx_1}_{\text{subst. } x_0 = \sin(x)}$$

$$= 2\pi$$

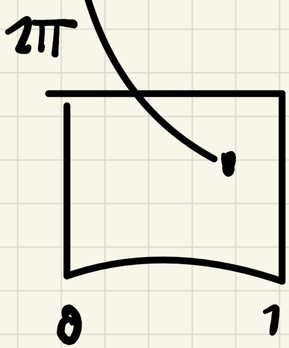
Polarkoord

Idee



$\varphi \in [0, 2\pi]$

$r \in [0, 1]$



$$p(r, \varphi) = \left(r\cos(\varphi),\ r\sin(\varphi)\right)$$

$$f(x_1, x_2) = 1 \Rightarrow f(\varphi(r,s)) = 1$$

$$\downarrow \varphi'(r,s)$$

$$\int_M 1 \, dy = \int_{[0,1]\times[0,2\pi]} 1 \, |\det(\varphi')| \, dr \, ds$$

$$\varphi'(r,s) \begin{pmatrix} \cos(s) & -r\sin(s) \\ \sin(s) & r\cos(s) \end{pmatrix}$$

$$\Rightarrow \det \varphi' = r$$

$$\int_{[0,1]\times[0,2\pi]} 1 \cdot \underline{r}\, d\varphi\, dr$$

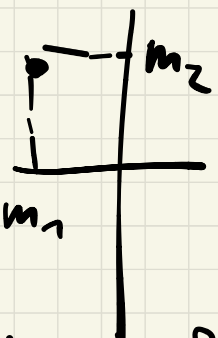
$$\overset{\text{Fubini}}{=} \int_0^1 \int_0^{2\pi} r \, d\varphi\, dr$$

$$= \int_0^1 \left[\varphi \cdot r \right]_0^{2\pi} dr$$

$$= \int_0^1 2\pi \cdot r \, dr = 2\pi \cdot \left[\frac{r^2}{2}\right]_0^1$$

$$= \pi.$$

$PT(r, \varphi) = ?$



Kreisgl. ?