# 2. Mengen

https://www.youtube.com/watch?v=A5vBhMFMM3c

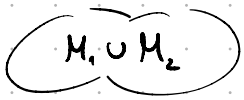
## 2.1 Generals

$M = \{ n \in \mathbb{N} \mid n = 2k, k \in \mathbb{N} \}$ („für die gilt")

$x \in M$ „x ist ein Teil von M"

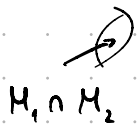



$M_1 \cup M_2 = \{ x \mid x \in M_1 \vee x \in M_2 \}$ („oder")




„Vereinigung"

$M_1 \cap M_2 = \{ x \mid x \in M_1 \wedge x \in M_2 \}$ („und")




„Schnitt"

$M_1 \setminus M_2 = \{ x \mid x \in M_1 \wedge x \notin M_2 \}$

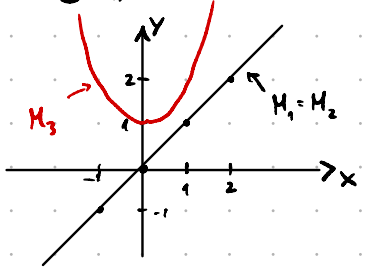


„ohne"

## 2.2 Zeichnen

### 2.2.1 (Un)-Gleichungen

$M_1 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid x = y \right\}$




$M_2 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid x - y = 0 \right\}$

$x - y = 0 \quad | + y$

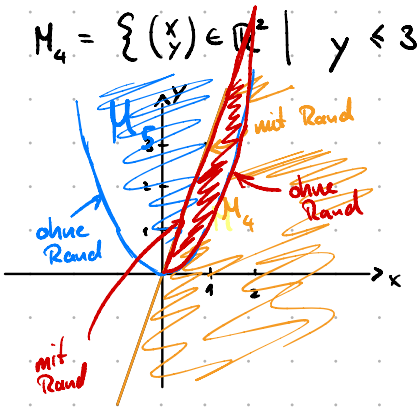
$x = y \Rightarrow M_2 = M_1$

$M_3 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid x^2 - y + 1 = 0 \right\}$

$x^2 - y + 1 = 0 \quad | + y$

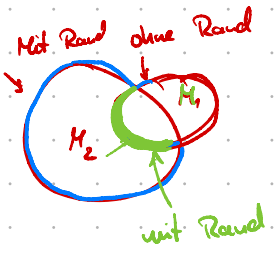
$x^2 + 1 = y$

$M_4 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid y \leq 3x \right\}$




$M_5 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid y > x^2 \right\}$

$M_6 = M_4 \cap M_5$




$M_2 \setminus M_1$

0 ohne
1 mit

## 2.2.2 Kreisgleichungen

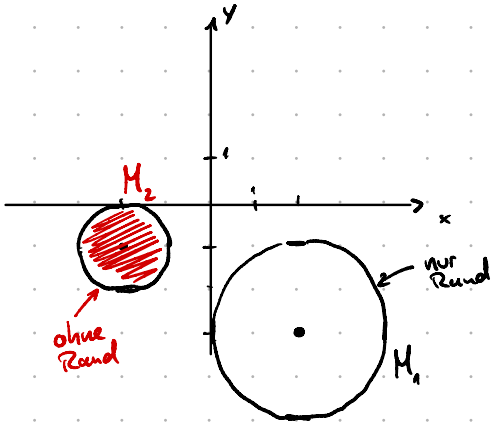
$$M_1 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid (x-x_0)^2 + (y-y_0)^2 = r^2 \right\}$$

definiert Kreis mit Radius $r$ und Mittelpunkt $MP = \begin{pmatrix} x_0 \\ y_0 \end{pmatrix}$

BSP

$$M_1 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid (x-2)^2 + (y+3)^2 = 4 \right\}$$

$MP = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ $\quad r = 2$




$$M_2 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid (x+2)^2 + (y+1)^2 < 1 \right\}$$

$MP = \begin{pmatrix} -2 \\ -1 \end{pmatrix}$ $\quad r = 1$

$$M_3 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid x^2 - 6x + y^2 + 4y \leq -4 \right\}$$

$(x-b)^2 = x^2 - 2bx + b^2$

$-6x \stackrel{!}{=} -2bx$

$b = 3$

$x^2 - 6x + 9 - 9$

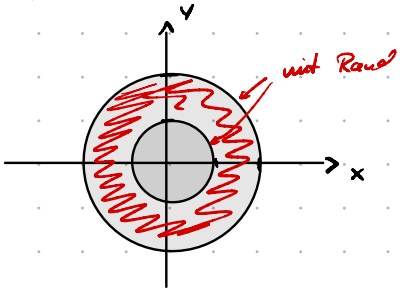
$(x-3)^2 - 9$

$2by = 4y$

$y^2 + 4y + 4 - 4$

$(y+2)^2 - 4$

$$M_4 = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid 1 \leq x^2 + y^2 \leq 4 \right\}$$




$\Rightarrow (x-3)^2 - 9 + (y+2)^2 - 4 \leq -4 \quad |+4 \; |+9$

$(x-3)^2 + (y+2)^2 \leq 9$

$MP = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $\quad r = 3$