Analyse the Glycose/Insulin - System:

Project parameters

Dose injection [mg] $D_v := 10$

Duration_injection [min] $\tau := 15$

Infusionrate: (for an infusion pump)

$\rho(t, D) := D \cdot e^{-0.05 \cdot (t - \tau)}$

Auxilliary parameters in the system

$$f(t, D) := \begin{cases} D & \text{if } 0 \le t < \tau \\ \rho(t, D) & \text{otherwise} \end{cases}$$

XY :=

	0	1	2
0	0	77.32	0
1	31.21	165.58	91.51
2	61.53	129.69	104.25
3	90.95	103.57	45.17
4	126.19	91.64	8.11
5	150	74.57	7.79

Define the ODE:

end := 200 Integration t (in minutes)

$(X \ \ Y) := \left(XY^{\langle 0 \rangle} \ \ XY^{\langle 2 \rangle}\right)$ $GL := XY^{\langle 1 \rangle} - XY_{0,1}$

Fit the observed Insulin data for Glycose and Insulin:

$(m_1 \ \ m_2 \ \ m_3 \ \ m_4) := (0.05 \ \ 0.01 \ \ 0.025 \ \ 0.01)$ **Initials**

$S(y, x) := y(x)$

Create the scalar function that will Minerr the **Paul. W Minerr** procedure as well as the original suggestion from Mathsoft Advisor

Vorgabe

$g'(t) = f(t, D_v) - m_1 \cdot g(t) - m_2\, i(t)$ $g(0) = 0$

$i'(t) = (m_3 \cdot g(t) - m_4 \cdot i(t))$ $i(0) = 0$

$$resid(m_1, m_2, m_3, m_4) := \left| \begin{array}{l} \begin{pmatrix} X1 \\ X2 \end{pmatrix} \leftarrow Gdglösen\left[\begin{pmatrix} g \\ i \end{pmatrix}, t, end\right] \\ \text{return } \overrightarrow{(S(X2, X) - Y)} \end{array} \right.$$

Vorgabe $resid(m_1, m_2, m_3, m_4) = 0$

$$\begin{pmatrix} m_1 \\ m_2 \\ m_3 \\ m_4 \end{pmatrix} := Minfehl(m_1, m_2, m_3, m_4)$$

$$\begin{pmatrix} m_1 \\ m_2 \\ m_3 \\ m_4 \end{pmatrix} = \begin{pmatrix} 0.0568 \\ 0.0274 \\ 0.0454 \\ 0.0144 \end{pmatrix}$$

Vorgabe

$g'(t) = f(t, D_v) - m_1 \cdot g(t) - m_2 \cdot i(t)$ $g(0) = 0$

$i'(t) = m_3 \cdot g(t) - m_4 \cdot i(t)$ $i(0) = 0$

$Sol(m_1, m_2, m_3, m_4) := Gdglösen\left[\begin{pmatrix} g \\ i \end{pmatrix}, t, end\right]$

$\begin{pmatrix} X1 \\ X2 \end{pmatrix} := Sol(m_1, m_2, m_3, m_4)$ Assign the optimized solutions to X1, X2
the Mathcad lspline internal vectors to Odesolve

Fit Lambert