4.2 Ratengleichung

a) $$\frac{dn_s(t)}{dt} = -0.6\, n_s(t)\left(n_s(t)+1\right) + 0.6\, n_s(t-2)\left(n_s(t-2)+1\right)$$

$$n_s(0) = 1$$

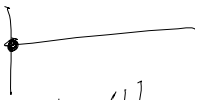
$$\frac{dm(t)}{dt} = -0.2\, n_s(t)\, m(t), \quad m(0) = 1$$

b) Rate an Robotern zu Hindernissen:

$$-2\alpha_r n_s^2 - \alpha_r n_s n_h - \alpha_p n_s m$$

$$= -\alpha_r n_s (n_s + 1) - \alpha_p n_s m$$

$$\frac{\partial n_s(t)}{\partial t} = -\alpha_r\, n_s(t)\left(n_s(t)+1\right) + \alpha_p\, n_s(t)\, m(t) + \alpha_r\, n_s\left(t-\tfrac{r}{s}\right)\left(n_s\left(t-\tfrac{r}{s}\right)+1\right) + \alpha_p\, n_s(t-\tau_h)\, m(t-\tau_h)$$



$$\frac{\partial m(t)}{\partial t} = -\alpha_p\, n_s(t)\, m(t)$$

$$\frac{\partial n_h(t)}{\partial t} = \alpha_p\, n_s(t)\, m(t) - \alpha_p\, n_s(t-\tau_{h0})\, m(t-\tau_{h0})$$