

1. (1.) $y'' = t + y + y'$

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= t + u_1 + u_2 \end{aligned}$$

(2.) $y''' = y'' + ty$

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= u_3 \\ u_3' &= u_3 + t u_1 \end{aligned}$$

(3.) $y''' = y'' - 2y' + y - t + 1$

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= u_3 \\ u_3' &= u_3 - 2u_2 + u_1 - t + 1 \end{aligned}$$

Exercise 9.2

b.) (1.) $y'' = y'(1 - y^2) - y$

~~$$y''' = y''(1 - y^2) - 2yy'$$~~

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= u_2(1 - (u_1)^2) - u_1 \end{aligned}$$

(2.) $y''' = -y y''$

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= u_3 \\ u_3' &= -u_1 u_3 \end{aligned}$$

(3.) $y_1'' = -GM y_1 / (y_1^2 + y_2^2)^{3/2}$ $y_2'' = -GM y_2 / (y_1^2 + y_2^2)^{3/2}$

$$\begin{aligned} u_1' &= u_2 \\ u_2' &= -GM u_1 / (u_1^2 + u_3^2)^{3/2} \\ u_3' &= -GM u_3 / (u_1^2 + u_3^2)^{3/2} \\ u_4' &= u_4 \end{aligned}$$