

HW2

$$\frac{dy}{dt} = \frac{y^3}{t+1}, \quad y(0) = 1$$

$$y^{-3} dy = \frac{1}{t+1} dt$$

$$-\frac{y^{-2}}{2} = \ln(t+1) + C$$

$$-\frac{1}{2y^2} = \ln(t+1) + C$$

$$-\frac{1}{2[\ln(t+1) + C]} = y^2$$

$$y = \sqrt{\frac{-1}{2 \cdot [\ln(t+1) + C]}}$$

$$1 = \sqrt{\frac{-1}{2 \cdot [\ln(0+1) + C]}}$$

$$1 = \sqrt{\frac{-1}{2 \cdot C}}$$

$$C = -1/2$$

$$y = \sqrt{\frac{-1}{2 \cdot [\ln(1+t+1) - 1/2]}}$$

HW2

2

$$y''(t) - 3y'(t) + 2y(t) = 0$$

$$y(0) = 2$$

$$y'(0) = 3$$

$$\lambda^2 - 3\lambda + 2 = 0$$

$$(\lambda - 1)(\lambda - 2) = 0$$

$$\lambda = 1, 2$$

$$y = c_1 e^t + c_2 e^{2t}$$

$$2 = c_1 + c_2$$

$$y' = c_1 e^t + 2c_2 e^{2t}$$

$$3 = c_1 + 2c_2$$

$$c_2 = 1$$

$$c_1 = 1$$

$$y = e^t + e^{2t}$$

3

$$A = \begin{bmatrix} 3 & -4 \\ 4 & 3 \end{bmatrix}$$

$$A_\lambda = \begin{bmatrix} 3-\lambda & -4 \\ 4 & 3-\lambda \end{bmatrix}$$

$$\det(A_\lambda) = \lambda^2 - 6\lambda + 9 = 0$$

$$A_{\lambda=3-4i} = \begin{bmatrix} 4i & -4 \\ 4 & 4i \end{bmatrix} \begin{bmatrix} c \\ b \end{bmatrix} = \begin{bmatrix} 4ia - 4b \\ 4a + 4ib \end{bmatrix} \quad a = -ib$$

$$\lambda^2 - 6\lambda + 25 = 0$$

$$v = \begin{bmatrix} -i \\ 1 \end{bmatrix}$$

$$\lambda = \frac{6 \pm \sqrt{36 - 100}}{2}$$

$$A_{\lambda=3+4i} = \begin{bmatrix} -4i & -4 \\ 4 & -4i \end{bmatrix} \begin{bmatrix} c \\ d \end{bmatrix} = \begin{bmatrix} -4ic - 4d \\ 4c - 4id \end{bmatrix} \quad c = id$$

$$c = id$$

$$v = \begin{bmatrix} i \\ 1 \end{bmatrix}$$

$$\frac{6 \pm 8i}{2}$$

$$\lambda = 3 \pm 4i$$

$$\lambda = 3 \pm 4i$$

$$v_{3-4i} = \begin{bmatrix} -i \\ 1 \end{bmatrix} \quad v_{3+4i} = \begin{bmatrix} i \\ 1 \end{bmatrix}$$