

HOMWORK 11, M 331  
DUE 4/30/09

**Problem 1.** Find the solution of the inhomogeneous ODE

$$y'' + y = \delta(t - \pi)$$

with initial conditions  $y(0) = y'(0) = 0$ .

**Problem 2.** Find the solution of the inhomogeneous ODE

$$y'' + 3y' + 2y = \delta(t - 5)$$

with initial conditions  $y(0) = 0$  and  $y'(0) = 1$ .

**Problem 3.** Consider the matrix ODE

$$y' = \begin{pmatrix} 3 & -2 \\ 2 & -2 \end{pmatrix} y$$

- (i) Find the general solution. Where does the solution tend to as  $t \rightarrow \infty$ ?
- (ii) Find the solution with initial condition  $y(0) = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ .
- (iii) Draw eigen directions and sketch some trajectories, in particular the one with the previous initial condition.

**Problem 4.** Find the solution to the matrix ODE

$$y' = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix} y$$

which satisfies  $y(0) = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$ . Draw eigen directions and sketch the solution you found.