

HOMEWORK 4, M 331
DUE 3/5/09

Problem 1. Consider the linear (inhomogeneous) ODE

$$y' + y = \sin t$$

- (i) Find all solutions to the homogeneous ODE.
- (ii) Find one particular solution of the inhomogeneous ODE.
- (iii) Write down all solutions of the ODE.
- (iv) What happens to the solutions when $t \rightarrow \infty$?
- (v) Find the solution which satisfies $y(0) = 0$.

Problem 2. Find the solution to $ty' + 2y = t^2 - t + 1$ with initial condition $y(1) = 1/2$.

Problem 3. Find all solutions of the ODE $y' + 2ty = 2te^{-t^2}$.

Problem 4. Find a value for y_0 so that the solution of the ODE $y' - y = 1 + \sin t$ with $y(0) = y_0$ remains finite as $t \rightarrow \infty$.

Problem 5. Solve the following ODEs (if an initial condition is given, find the solution satisfying this condition):

- (i) $y' - 2y = t^2 e^{2t}$, $y(0) = 0$
- (ii) $ty' + (t + 1)y = t$, $y(\ln 2) = 1$
- (iii) $y' + y = \frac{1}{1+e^t}$