

Quiz # 4– Math 2233, Differential Equations – Sep. 25, 2008

1. Solve the initial value problem

$$\begin{cases} y'' - y' - 2y = 0 \\ y(0) = 1, y'(0) = -1 \end{cases}$$

Solution: The characteristic equation is

$$r^2 - r - 2 = 0.$$

It has two distinct real roots:

$$r_1 = -1, \quad r_2 = 2.$$

Hence the general solution is

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

Now we apply the initial condition,

$$\begin{cases} c_1 e^0 + c_2 e^0 = 1 \\ -c_1 e^0 + 2c_2 e^0 = -1 \end{cases} \Rightarrow \begin{cases} c_1 + c_2 = 1 \\ -c_1 + c_2 = -1 \end{cases}$$

Solve this system of two linear equations, we have

$$c_1 = 1, \quad c_2 = 0.$$

Hence the particular solution to the initial value problem is

$$y = e^{-t}.$$