PART III

7. Solve the equation

$$x(1 - x)y'' + (c - (a + b + 1)x)y' - aby = 0$$

around the origin, where a, b and c are constants.

8. Two masses $m_1=2$ and $m_2=1$, are connected by springs of moduli $k_1=2$, $k_{12}=2$, and $k_2=1$, as shown in the following figure. Neglecting all frictional effects and assuming that each spring is unstretched when the system is in its equilibrium position, determine the frequencies of the free vibrations of the system and discuss the motion of the system at each of these frequencies. If the system starts to move from rest in a position in which $m_1$ is displaced one unit to the left and $m_2$ is displaced two units to the right, find the subsequent displacements of $m_1$ and $m_2$ as functions of time.