Second Order Linear Equations

1. Determine the longest interval in which the given IVP is certain to have a unique, twice differentiable solution:

　　a. $t(t-4)y'' + 3ty' + 4y = 2, \quad y(3) = 0, \; y'(3) = -1$

　　b. $(\ln t)y'' + \dfrac{t}{t^2 - 4}y' + y = 0, \quad y(1.5) = 4, \; y'(1.5) = 1$

　　c. $y'' + t^2 y' + \tan(t)y = 2, \quad y(0) = 1, \; y'(0) = -1$

2. Solve the IVP, sketch the solution in the ty-plane and sketch the phase portrait (solution in the yy'-plane).

    a. $3y'' - 7y' + 2y = 0,$ $y(0) = -6,$ $y'(0) = -7$

    b. $y'' + 8y' - 9y = 0,$ $y(1) = 1,$ $y'(1) = 0$