Written Assignment #12: Systems of Differential Equations
Due 5:00pm Tuesday, November 18, 2003

You are encouraged to collaborate with your colleagues. For credit, however, your final write-up must be done individually. Show all your work and make your presentation comprehensible.

1. For each of the following systems, find the equilibrium point and classify it as stable, unstable, or neither.

   (a) \[ \frac{dx}{dt} = x - 2y, \]
       \[ \frac{dy}{dt} = 3x - 4y - 2. \]
   (b) \[ \frac{dx}{dt} = x - 5y - 5, \]
       \[ \frac{dy}{dt} = x - y - 3. \]

2. For each of the following models, find the equilibrium points and classify each of them as stable, unstable, or unable to tell.

   (a) \( x(t) \) and \( y(t) \) are the populations of two species that are in competition with each other and are modelled by the following system

       \[ \frac{dx}{dt} = 14x - 2x^2 - xy, \]
       \[ \frac{dy}{dt} = 16y - 2y^2 - xy. \]

   (b) \( x(t) \) and \( y(t) \) are the populations of two species, one the predators and the other the prey, and are modelled by the following system

       \[ \frac{dx}{dt} = 200x - 4xy, \]
       \[ \frac{dy}{dt} = -150y + 2xy. \]