

**Workshop 1 - Problems**

Wed. June 3, 2009

**Problem 1.** Let  $y(t)$  be the solution to the initial value problem

$$\frac{dy}{dt} = y^2 - 14y + 45, \quad y(0) = 9.$$

What is the value of  $y(11)$ ?

**Problem 2.** Find the general solution to

$$\frac{dy}{dt} = (\cos t)e^{-2y+\sin t}.$$

**Problem 3.** Suppose  $y_1(t) = 3t - 1/t$  and  $y_2(t) = 2 + 3t$  are solutions of  $dy/dt = f(t, y)$ , and that for this equation the conditions of the uniqueness theorem are satisfied in the entire first quadrant. Let  $y(t)$  be the solution with  $y(1) = 4$ . What is the value of

$$\lim_{t \rightarrow \infty} \frac{y(t)}{t}?$$

**Problem 4.** Find a function  $g(t)$  such that  $y(t) = t^2g(t)$  is a solution to

$$\frac{dy}{dt} = \frac{2y}{t} + 1.$$

**Problem 5.** Suppose  $y(t)$  is the solution to the initial value problem

$$\frac{dy}{dt} = \frac{t}{y + t^2}, \quad y(3) = -8.$$

What is the value of  $y''(3)$ ?