Weekly Homework 4

Gerardo Ferrara
Integrals & Dynamic Analysis
Due 1:00 pm Monday, December 17, 2012

Exercise 1. (6 points) Compute the integrals:

$$\int_0^1 xe^{2x}\,\mathrm{d}x$$
$$\int x^6 ln(x)\,\mathrm{d}x$$
$$\int (ln(x))^2\,\mathrm{d}x$$
$$\int (ln(x))^3/x\,\mathrm{d}x$$
$$\int x\sqrt{3x+1}\,\mathrm{d}x$$
$$\int x^3(ln(x))\,\mathrm{d}x$$

Exercise 2. (6 points) Solve the following differential equations with separable variables:

$$a) x'(t) = -e^t x(t)$$
$$b) x'(t) = \frac{t}{2x(t)}$$

Exercise 3. (6 points) Solve the following Cauchy problem:

$$\begin{cases} x'(t) &= (1-x(t))/t \\ x(1) &= 0 \end{cases} \qquad \begin{cases} x'(t) &= 2x(t)+1 \\ x(0) &= 1 \end{cases}$$

Exercise 4. (6 points) Solve the following linear first order differential system with constant coefficients:

$$\begin{cases} x_1'(t) = x_1(t) + x_2(t) \\ x_2'(t) = x_1(t) - x_2(t) \end{cases}$$

Exercise 5. (6 points) Solve the following linear second order differential equation with constant coefficients transforming it into a first-order linear system (check your solution with the characteristic function):

$$x''(t) + 2x'(t) + 5x(t) = 0$$