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# MATH 440/540 - Applied Mathematics

## Final Project (for undergraduate students)

*Date assigned:* April 13, 2009

*Due date:* **May 6, 2008**

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- Include a cover page and *this* problem sheet
  - Include the printout of your program(s) for completeness
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1. Consider the following initial value problem :

$$-ydx + xdy = 0 \tag{1}$$

$$y(1) = 1$$

- Solve IVP (1) analytically using appropriate method.
- Solve IVP numerically using explicit Euler method
- Plot the numerical and analytical solutions for  $x \in [1, 10]$ .
- Compute the maximum norm of the difference between numerical and analytical solutions.

2. Consider the following initial value problem :

$$\frac{d^2u}{dx^2} + 2\frac{du}{dx} - 3u = 0 \tag{2}$$

$$u(0) = 2; \frac{du}{dx} = -2$$

- Solve IVP (2) analytically using appropriate method.
- Transform (2) into the system of two first order equations.
- Solve the resulting system numerically using explicit Euler method for systems.
- Plot the numerical and analytical solutions for  $x \in [0, 2]$ .
- Compute the maximum norm of the difference between numerical and analytical solutions.