NAME:_____

Problem Set 1a: Introduction

Assigned: Thursday 09/09/04 Due: Tuesday 09/21/04

Exercise 1.1:

Please, fill out the survey.

To download the survey, go to: http://mit.edu/13.021/www/assign.html → "Survey".

Grading: The following survey is part of Problem Set 1a and will receive either 0 or 1 credit. If reasonable effort is demonstrated full credit (i.e. 1) will be assigned.

Exercise 1.2:

Purpose: This exercise is intended to introduce you to the visualization of fluid flows.

Instructions: Watch the first 15 min of the film "Flow Visualization". To watch the film either:

1. Download it from: http://web.mit.edu/13.021/www/assign.html → "Flow Visualization".
2. Borrow a copy from the TA; available in CD's and DVD's.
3. Watch it at the Barker Engineering Library. Call number: QC151.F5.

Assignment: Describe in a *short* paragraph the concepts of: pathline, streakline and streamline, as you understand them. Provide one example for each case.

Exercise 1.3:

Purpose: This exercise is intended to refresh your calculus and vector calculus background.

Suggested References: F.B. Hildebrand, "Advanced Calculus for Applications", Prentice Hall, 2nd edition.

1. *Taylor's Series Expansion*, *1D*: *Let* f be a real function of x, where $x \in \Re$. Complete the following expression:

   $f(x+dx) = f(x) +$

2. Apply the previous formula to evaluate the following - without using a calculator:
   - $e^{0.01} \cong$

3. *Notation*: Expand the following expression, where $k = 1, 2$:

   $$\sum_{n=0}^{3} a_n \, b_k \, x^n =$$

NAME:_____

4. A scalar has magnitude and direction: (circle the right answer and comment if necessary)
   - True
   - False
   - Only under the assumption that _____

5. *Assume* that $f(x,y)=\frac{\ln(x\cdot y)}{x}$. Then
   - $\frac{\partial}{\partial x}f=$
   - $\frac{\partial}{\partial y}f=$
   - $\vec{\nabla}f=$

6. Evaluate $\int_{-\pi}^{\pi} x\cos(x)dx$

Exercise 1.4:

Supplemental Problems (http://mit.edu/13.021/www/supp_notes.html): C1, C2, C3, C6, C10, C11 (a), Ba3