Tutorial Problems for Tuesday, 30 August 2011

1. Which of the following sets of equations represent possible two-dimensional incompressible flows ?

   (a) $u = 2x^2 + y^2 - x^2 y;$ $v = x^3 + x(y^2 - 2y)$

   (b) $u = xt + 2y;$ $v = xt^2 - yt$

   (c) $u = (x + 2y)xt;$ $v = -(2x + y)yt$

2. For a flow in the $x - y$ plane, the x component of the velocity is given by $u = Ax(y - B)$ where $A = 3.3\,m^{-1}s^{-1}$, $B = 1.8m$, and x and y are measured in m. Find a possible y component for steady incompressible flow. Is it also valid for unsteady, incompressible flow ? Why ? How many y components are possible ?

3. Which of the following sets of equations represent possible incompressible flow cases ?

   (a) $v_r = U\cos\theta;$ $v_\theta = -U\sin\theta$

   (b) $v_r = -\frac{q}{2\pi r};$ $v_\theta = \frac{K}{2\pi r}$

4. Problem 4.23 from Gupta & Gupta.

5. Problem 4.24 from Gupta & Gupta.