AE 360
Homework 2
Due: Thursday, 23 January 1997, in class

1. From the AE 360 documents page, retrieve the "Sample LaTeXdocument" and the "Sample eps figure" (which should be saved in your local space as "sample.figure.eps"). Edit the file so that your own name appears in place of that of Pat Q. Student. Follow the instructions on LaTeXusage in the text of the document and generate an appropriate postscript file. Post this file on your personal home page (which you may need to initialize!). Do not turn in a hardcopy.

2. Retrieve the file under the link "LaTeXtemplate" on the AE 360 documents home page. This file contains a template and instructions for a short review you will write on an article from *Aviation Week and Science Technology*. Post your postscript file on your personal home page. Do not turn in a hardcopy.

3. Exercise on p. 19 of course notes

4. Exercise on p. 25 of course notes

5. Write the x component of the momentum equation for a compressible, Newtonian fluid.

6. Water, an incompressible, Newtonian viscous fluid, has $\rho = 1000\ \frac{kg}{m^3}$, $\mu = 855 \times 10^{-6}\ \frac{N\ s}{m^2}$ and velocity field $u = \left(0.10\ \frac{1}{m^2\ s}\right) y^3$, $v = \left(0.5\ \frac{1}{m\ s}\right) x^2$, where x and y are measured in meters. At the origin, the pressure has magnitude 100 kPa. Use computer graphics to plot the velocity vector field and the streamlines. Determine an analytic expression for the pressure field. Use computer graphics to plot isobars in the $x - y$ plane. Find an expression for the viscous stress tensor as a function of x and y. At the point $x = 0.3\ m$, $y = 0.5\ m$ find the orientation of the principal axes of stress and the magnitude of the principal values of stress. Look up the sound speed of water and give an estimate of the limits of the domain in $x - y$ space for which the incompressibility assumption is valid.

7. Anderson, 1.4, p. 31

8. Anderson, 1.5, p. 31