AE 360
Homework 12
Due: Thursday, 24 April 1997, in class

1. Show that
$$u(y,t) = \sqrt{\frac{\nu}{t}} \exp\left(-\frac{y^2}{2\nu t}\right)$$
   is a solution to the linear momentum equation. Use mathematica to give a three-dimensional plot of $u(y,t)$ if the fluid is SAE 30 oil.

2. SAE 30 oil is initially at rest between two flat parallel plates, separated by a gap width of $2\ mm$. At $t = 0+\ s$, a pressure gradient of $100\ \frac{kPa}{m}$ is applied to the fluid. Find an analytic expression for the space and time variation of the velocity of the fluids between the plate. Plot the velocity as a function of distance at three representative times.

3. Fox and McDonald, 9.31, p. 472. Perform an actual numerical integration of Equations (9.11) and (9.12) to reproduce the results in Table 9.1, that you will use in your plots.

4. Fox and McDonald, 9.39, p. 473.