AME 538
Numerical Project 2
Prof. J. M. Powers
Due: December 11, 1992

1. Consider Stokes' first problem, the suddenly accelerated flat plate.

   - Plot the dimensionless velocity u_* as a function of the similarity variable η_*.
   - For $Pr = 1$, plot the dimensionless temperature T_* as a function of the similarity variable η_* for $Ec = 0, 1/4, 1/2, 3/4, 1$. Put all of the temperature profiles on a single plot.
   - If the fluid is air, initially at atmospheric conditions, and the plate is pulled at $50 m/s$ generate dimensional plots of $u(y, t)$ and $T(y, t)$. Assume the thermal conductivity k is such that $Pr = 1$. Take the ordinate to be y and the abscissa to be either u or T; plot the profiles at various t. Choose the range of y and t such that a meaningful variation is displayed.
   - *optional*– Repeat the above plots for real properties of air.

2. Consider the Blasius problem, flow over a flat plate.

   - Plot the dimensionless velocity u_* as a function of the similarity variable η_*.
   - For $Pr = 1$, plot the dimensionless temperature T_* as a function of the similarity variable η_* for $Ec = 0, 1/4, 1/2, 3/4, 1$. Put all of the temperature profiles on a single plot.
   - If the fluid is air, initially at atmospheric conditions, and the freestream velocity is $50 m/s$ generate dimensional plots of $u(x, y)$ and $T(x, y)$. Assume the thermal conductivity k is such that $Pr = 1$. Take the ordinate to be y and the abscissa to be either u or T; plot the profiles at various x. Choose the range of y and x such that a meaningful variation is displayed.
   - *optional*– Repeat the above plots for real properties of air.

Treat this as a formal report. The report should begin with a two page maximum verbal description of the problem and your solution. Include full references if necessary. The text should refer to each figure, which should appear on the following pages. Each figure should be computer generated and labeled. If you feel it necessary, detailed calculations can be reported in appendices. The main text should be done with LaTeX. The appendices can be hand done.