

G13 (Individual)  
Using MatLab to solve ODEs  
Due February 18, 2010

Numerically solve the famous Lorenz equations

$$\begin{aligned}x' &= \sigma(y - x), \\y' &= rx - y - xz, \\z' &= -bz + xy,\end{aligned}$$

using MatLab.

- 1) Set  $\sigma = 10$ ,  $b = 8/3$ , and  $r = 28$ . Make a single plot of the  $x$  versus  $t$  plane which contains two curves: one which has initial condition  $(5, 5, 5)$ , the other has IC  $(5.01, 5, 5)$ . The  $t$  axis should go at least to 20.
- 2) Set  $\sigma = 10$ ,  $b = 8/3$ , and  $r = 28$  and start at point  $(5, 5, 5)$ . Make a set of three plots using the subplot command. Each plot contains one curve: one is the  $xy$ -plane, one is the  $xz$ -plane, and one is the  $yz$ -plane.
- 3) Set  $\sigma = 10$ ,  $b = 8/3$ , and  $r = 21$ . Make a set of three plots of the  $x$  versus  $t$  plane using the subplot command. Each plot contains one curve: one starts at the point  $(3, 8, 0)$ , one starts at the point  $(5, 5, 5)$ , and one starts at the point  $(5, 5, 10)$ . The  $t$  axis should go at least to 80.

Send me the .m files, one for each part, which created your figures. Include your plots in a brief LaTeX write up. Your comparison should be submitted electronically as a .pdf file.