**HOMEWORK 13**

**GIVEN MONDAY DEC. 1, 1997, DUE FRIDAY DEC. 19, 1997**

1. A structural geologist surveys a region of exposed granitic rocks and measures the strike direction of numerous joints. The file `joints.d` contains the azimuths (° from North toward East) of these orientations.

   a) At the 95% level of confidence, is there a preferred orientation in the data? If so, what is the preferred orientation?

   b) Regional tectonic considerations seem to favor a general extensional stress regime in the west-northwest – east-southeast orientation. Is this explanation for the joints consistent with the data at the 95% level of confidence?

   c) 30 km further north another exposure of the batholith reveals more joints (`morejoints.d`). Are they randomly oriented?

   d) Do these new joints deviate significantly from the preferred orientation you found for the first site?

2. Another geologist has measured the strikes and dips of faults in a Cretaceous sedimentary layer. The values are recorded below:

   | Strike | 144 | 158 | 145 | 151 | 149 | 156 | -13 | 139 | 155 | -7 | 148 | 141 |
   | Dip    | 44  | 49  | 52  | 38  | 56  | 44  | 7   | 49  | 45  | 9  | 59  | 42  |

   a) Find the mean direction and the mean resultant length. Is this direction significant at the 95% level of confidence?

   b) While you were sleeping, evil data-contaminators did their dirty work of adding bad vectors to your data. Use what you know about LMS mode estimates to determine a modal direction for this spherical data set (hints: What estimate of misfit does the LMS mode minimize? The dot product of two unit vectors gives the cosine of the angle between them. By empirically keeping track of the misfit as a function of position you can find the ‘best’ mode location).