36-315: Statistical Graphics and Visualization

Homework 10
Date: March 17, 2003   **Due: start of class March 31, 2003**

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1. In a rectangular projection tangent at the equator, which parallels are true? Which meridians are true?

2. Make a map which proves that the shortest path from California to Iraq crosses Greenland. Iraq is at $33°N$ and $43°E$.

3. In this problem, you will make statistical maps of Pennsylvania, using the data in `hw10.csv` and the functions from lab 10.

   (a) Make a map of Pennsylvania using a conic equal-area projection, with standard parallels chosen to minimize distortion over the state. Don't draw counties.

   (b) Make a dot map of the census tracts. To do this, first make a scatterplot of the tracts and then overlay the map. The frame contains the latitude and longitude of the center of each census tract, in the columns `LAT` and `LON`. However, these need to be projected to line up with the map. This is done as follows:

   ```
   xy = mapproject(frame[,"LON"],frame[,"LAT"])
   frame[,"x"] = xy["x"]
   frame[,"y"] = xy["y"]
   ```

   The projected coordinates are now columns `x` and `y` of the frame. Because census tracts are chosen to have similar populations, there will be more tracts where the population density is higher.

   (c) Now make a similar map but with the census tracts colored according to per-capita income (`PCI`). This can be done by making a color plot and then overlaying the map. Explain the pattern in incomes by relating it to results from earlier in the class.

   (d) Make colored dot maps of the percentage of Native Americans (`PCTAMIND`) and Hispanics (`PCTHISP`) in Pennsylvania census tracts. What is the main difference between the spatial distribution of these two ethnic groups? Describe it briefly, in twenty words or less.