

Due Date: 20 September 2007

1. Download R from the Comprehensive R Archive Network and install it in on your computer. Use the `help` function to learn about the commands `plot`, `seq`, `par`, `lines`, `legend`, `rnorm`, `hist`, `paste`, `image`, `heatmap`, and `boxplot`. Why did we choose this list of functions for you to learn about?
2. Plot $\sin(x)$ on the interval $0 \leq x \leq 3\pi$. Label the axes with something meaningful.
3. Plot both $\sin(x)$ and $\cos(x)$ for $0 \leq x \leq 3\pi$ on the same axes. Use colors or line styles to distinguish the two curves. Include a figure legend that explains how to tell which curve is which.
4. Generate a random normal vector containing 1000 elements.
 - (a) Plot the data.
 - (b) Plot the data after first sorting it in increasing order.
 - (c) Plot a histogram of the data.
 - (d) Plot a histogram of the data with 70 bars.
5. Generate two random normal vectors x and y , each containing 100 elements.
 - (a) Compute the correlation coefficient between x and y .
 - (b) Plot y as a function of x , and add the correlation coefficient to the plot (as a legend, a label, or a text string).
 - (c) Perform a t -test comparing x and y . What are the t -statistic and the p -value?
 - (d) Let $z = y + 1$. Repeat parts (a) and (c) using z instead of y .
 - (e) Let $z = y + k$ for a constant k of your choice. Repeat parts (a) and (c) using z instead of y . How large should you choose k to ensure that the p -value is smaller than 0.05?
 - (f) Repeat part (e) when x and y contain only 25 elements.
6. Generate a random normal matrix with 100 rows and 50 columns.
 - (a) Draw an image of the matrix. Change the axes so they indicate the correct row and column numbers.
 - (b) Experiment with the color options and redraw the image using a non-default color map.
 - (c) Draw a heatmap of the matrix.
 - (d) Convert the matrix into a data.frame, and draw a boxplot of the data.frame.
7. Read the R help documentation on `library`, which explains how to use the extra tools available in R libraries. Load the `lattice` package and work through the examples in the help page for `wireframe` and `cloud`.