Assignment 9

1. (a) Modify your `pareto` package to include a function `rpareto`, written in R only, for generating random variables from a Pareto distribution. Your function should follow the standard usage of random number generator functions in R. Your package should pass `R CMD check` without errors, warnings, or notes. In your writeup explain what method you used to implement your generator and show some usage examples.

   (b) Add a function `rcpareto` to your package that takes the same arguments as `rpareto` and generates its random numbers in C code. The section of the R extension manual on *Random number generation* provides the information you need for this. Again explain your method and show some examples of use in your writeup.

You should submit your assignment electronically using Icon. Submit your work as a single compressed tar file. If your work is in a directory `mywork` then you can create a compressed tar file with the command

```
tar czf mywork.tar.gz mywork
```

Solutions and Comments

1. Some notes:

   - Follow the coding standards on indentation — make sure you do not have tabs in your code.
   - Follow the coding standards on avoiding long lines, proper indentation, and use of spaces.
   - Make sure you are generating from the correct distribution. A simple check:

     ```
     ppareto(rpareto(n, a, b), a, b)
     ```

     should look like a sample from a uniform distribution on $[0, 1]$.
   - Given that you have a working `qpareto` it makes sense to start with that for your inversion-based generator.
   - Checking generator output can be tricky:
     - Lots of statistical tests are available, but they do fail some of the time even when things are working properly.
     - Using a small α and fixing the generator and seed can help.
   - Your code should check for bad parameter values.
   - You should follow the convention that the length of `n` is used as the number of variables to generate if it is greater than 1.
   - If you are calling `warning` from your C code it it best to call `PutRNGState` first.
   - If you are using C code for generation then it makes sense to use do the inverse CDF calculation in C, not R.

   Some test code is available in

   `http://www.stat.uiowa.edu/~luke/classes/STAT7400/paretoRNGtests.R`