

# STAT2005 Programming Languages for Statistics

## Assignment 2

Due: 8 March 2024

1. Consider the built-in data frame `pressure`.

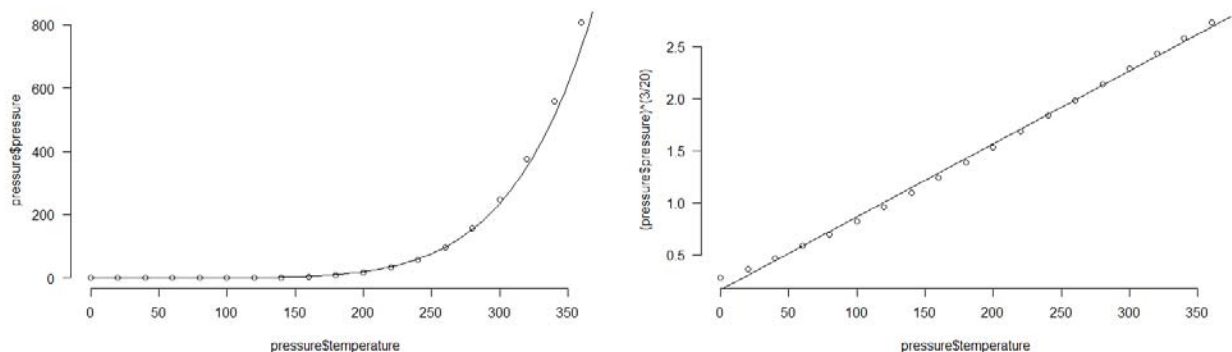
(a) Plot `pressure` against `temperature`, and use the following command to pass a curve through these data:

```
curve((0.168 + 0.007*x)^(20/3), from = 0, to = 400, add = TRUE)
```

(b) Now, apply the power transformation  $y^{3/20}$  to the `pressure` data values. Plot these transformed values against `temperature`. Is a linear or nonlinear relationship evident now? Use the `abline()` function to pass a straight line through the points. (You need an intercept and slope for this – see the part (a) of this question to obtain appropriate values.)

(c) Add a suitable title to the graph.

(d) Re-do the above plots, but use the `mfrow()` function to display them in a  $1 \times 2$  layout on the graphics page. Suppress the surrounding box and arrange the numeric axis labels to be horizontal. A sample output is given below. (see `help(par)`)

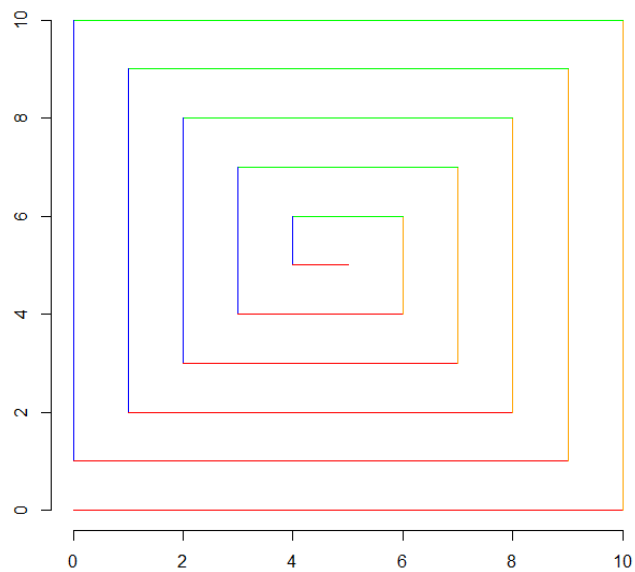


2. Write a function named `alt_matrix()` which accept a positive integer `n` and return a square matrix with alternating 0 and 1 as shown below.

```
> alt_matrix(7)
      [,1] [,2] [,3] [,4] [,5] [,6] [,7]
[1,]    0    1    0    1    0    1    0
[2,]    1    0    1    0    1    0    1
[3,]    0    1    0    1    0    1    0
[4,]    1    0    1    0    1    0    1
[5,]    0    1    0    1    0    1    0
[6,]    1    0    1    0    1    0    1
[7,]    0    1    0    1    0    1    0
```

```
alt_matrix <- function(n) {
  m <- matrix(0, n, n)
  for (i in 1:n) {
    for (j in 1:n) {
      if (m[i,j] == 0) {
        m[i,j+1] <- 1
        m[i+1,j] <- 1
      }
    }
  }
  return m
}
```

3. Use R to draw the following graph.



Note: the four colours are "red", "orange", "green", and "blue".

4. A twin prime is a pair of primes  $(x, y)$ , such that  $y = x + 2$ . Construct a vector of all twin primes less than 1000.

You should submit a file `asg2.r` via Blackboard, which contains all the R codes you use to finish this assignment. The codes should be commented as clearly as possible. Written work (if any) should also be attached.