Class 7, Homework Assignment

Question 1 (2 points). Use a double loop to create a 9 rows by 9 columns matrix that contains the distance among all 9 locations. For example, the cell in the 2nd row and 3rd column should contain the distance between the second and third locations, given by

$$\sqrt{(x_2 - x_3)^2 + (y_2 - y_3)^2}$$

The geographic coordinates of each of the 9 locations is given below:

```
x <- rep(c(1,3,5), times=3)
y <- rep(c(1,3,5), each=3)
```

Question 2 (2 points). Use a double loop to create a 5 rows by 5 columns matrix. This matrix will contain the correlation between all the pairwise combinations of the 5 variables (columns) in the dataset below:

```
set.seed(1)
dat <- data.frame(matrix(rpois(20*5, lambda=3), nrow=20, ncol=5))
```

For example, the cell in the 2nd row and 3rd column should contain the correlation between the second and third variables. You can calculate this correlation using the code below:

```
cor(dat[,2], dat[,3])
```

```
## [1] 0.3245722
```

Question 3 (2 points). Create a matrix with integers from 1 to 16, 4 rows and 4 columns. Use a loop to calculate the minimum number for odd columns and maximum number for even columns and save these numbers in a vector.

Question 4 (2 points). Use the code provided below to create a lower triangular matrix. Use a double loop to fill in the upper triangular part of the matrix with the values in the lower triangular part to make it a symmetric matrix.

```
a <- matrix(rnorm(n=25, mean=0, sd=1), 5, 5)
a[upper.tri(a, diag = FALSE)] <- 0
a
```

```
##            [,1]       [,2]        [,3]      [,4]      [,5]
## [1,]  0.3981059  0.0000000  0.00000000 0.0000000  0.000000
## [2,] -0.6120264 -0.3672215  0.00000000 0.0000000  0.000000
## [3,]  0.3411197 -1.0441346  0.68973936 0.0000000  0.000000
## [4,] -1.1293631  0.5697196  0.02800216 0.1532533  0.000000
## [5,]  1.4330237 -0.1350546 -0.74327321 2.1726117 -1.253633
```

Question 5 (2 points). Use the code provided below to create a data frame with 100 random numbers, 25 rows and 4 columns. Assuming that this data frame contains populatin size of four lizard species in 25 years (1991-2015). Plot a time series for each species. Only plot lines. Use a loop to plot all 4 species in one panel and use different colors to distinguish the species.

```
b <- data.frame(matrix(rpois(n=100, lambda=1000), nrow=25, ncol=4, byrow=T))
```