Chapter 7 Questions

7.1 Write a single R command that calculates: $sin(e^4 + \sqrt{arccos(1/3)})$

7.2 What is returned by the following R command ? (Guess before computing this in R.)

```
x <- c(pi, 4/3, 7)
round(x,2)
```

7.3 What is returned by the following R commands ?

```
x <- (1:10)^2
diff(range(x))
```

7.4 What is returned by the following R commands ?

```
x <- 1:4
y <- 4:1
pmax(x,y)
```

7.5 What is returned by the following R commands ?

```
x <- 1:4
cumsum(x)
```

7.6 What is returned by the following R commands ?

```
x <- c(1,1,1,-1,-1,-1,NA)
y <- c(0,1,4, 0,-1,NA, 1)
x / sqrt(y)
```

7.7 What is returned by the following R commands ?

```
x <- seq(1,7,by=3)
sum(x^2) / length(x)
```

7.8 What is returned by the following R commands ?

```
sqrt(max(9:-3))
```

7.9 Let `x` be a vector of length three or greater that contains numeric elements. Write a single R command that calculates the sample mean of all of the elements of `x` except the smallest and largest.

7.10 Write an R command that creates a 2 x 3 matrix named `x` that contains the first six positive integers entered row-wise into the matrix. Display `x`. Then write another R command that uses the `dim` function to change the dimensions of `x` to a 3 x 2 matrix. Display the updated matrix `x`.

7.11 Write two R commands that calculate $\sum_{i=1}^{15} \left(\frac{2^i}{i!} - \frac{cos(3i)}{i^4} \right)$

7.12 Write two R commands that calculate

$$\prod_{x=4}^{12} \left| \frac{x(x-1)(x-2)}{(x-3)!} + \frac{arctan(x)}{x^2} \right|$$

7.13 Write a single R command that calculates:

$\frac{3}{4} + \left(\frac{3}{4} \cdot \frac{5}{6}\right)\left(\frac{3}{4} \cdot \frac{5}{6} \cdot \frac{7}{8}\right) + \cdots + \left(\frac{3}{4} \cdot \frac{5}{6} \cdot \frac{7}{8} \cdots \frac{49}{50}\right)$

7.14 Write a single R command that calculates e^e.

7.15 Write a single R command that calculates: $1^3 + 2^3 + \cdots + 100^3$

7.16 Using a minimum number of keystrokes, write a single R command that creates a vector with elements:

$\left(5, \frac{5^2}{2!}, \frac{5^3}{3!}, \ldots, \frac{5^{10}}{10!}\right)$

7.17 Write a single R command that calculates:

$$\sum_{i=3}^{8} \sum_{j=2}^{9} \frac{i^2}{7 + 4j}$$

Which simplifies to:

$$\left(\sum_{i=3}^{8} i^2\right)\left(\sum_{j=2}^{9} \frac{1}{7 + 4j}\right)$$

7.18 The two-element vector named `point1` contains the x-coordinate and the y-coordinate of a point on the Cartesian coordinate system. Likewise for `point2`. Write a single R command that calculates the quantity of interest requested below.

1. Calculate the distance between the two points, where "distance" is interpreted as the Euclidean distance, the distance "as the crow flies," or the L_2 norm.
2. Calculate the rectilinear distance between the two points, where "rectilinear distance" is interpreted as the "Manhattan distance", "taxicab norm," or the L_1 norm.

7.19 Experiment with the `Sys.sleep` function using a single argument, a small integer, to determine its purpose.

7.20 Compose two R functions so as to count the number of distinct elements in a vector named `x`.

7.21 An unsorted 99-element vector named `x` contains all but one of the first 100 positive integers. Write a single R command that determines the missing integer.

Exercises taken from Chapter 7, "Learning Base R", by Lawrence M Leemis, ISBN 978-0-9829174-8-0