5. Problem Statement

- 1. Create an m x n matrix with replicate(m, rnorm(n)) with m=10 column vectors of n=10 elements each, constructed with rnorm(n), which creates random normal numbers.
- Then we transform it into a dataframe (thus 10 observations of 10 variables) and perform an algebraic operation on each element using a nested for loop: at each iteration, every element referred by the two indexes is incremented by a sinusoidal function, compare the vectorized and non-vectorized form of creating the solution and report the system time differences.

Answer as follows

RStudio <u>File Edit Code View Plots Session Build Debug Profile Tools Help</u> 🔾 🕶 😭 🚰 🔻 🔒 👛 🖟 Go to file/function 📗 🔻 Addins 🕶 $-\Box$ 1 # This is a bad loop with 'growing' data 2 set.seed(42) 3 m=10 4 n=10 5 6 # Create matrix of normal random numbers 7 mymat <- replicate(m, rnorm(n))</pre> 9 # Transform into data frame 10 mydframe <- data.frame(mymat)</pre> 11 12 - for (i in 1:m) { 13 - for (j in 1:n) { 14 mydframe[i,j] < -mydframe[i,j] + 10*sin(0.75*pi)15 print(mydframe)

R console as below

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                                     X4
                                                                  Χ
   9.102607 7.387104 6.008132 6.797954 7.026417 5.594828 6.00888
1
   6.186503 8.810395 7.664154 6.889339 8.137879 5.591697 6.44402
```

```
7.147654 7.727343 6.823579 7.283025 7.842809 6.207072 8.32681
4
   3.678166 6.410379 6.370663 7.581998 6.921483 5.678612 7.39647
5
7
   8.106497 7.594440 8.372542 8.099356 8.321336 6.393929 6.66165
6
   7.282452 8.228871 8.500722 5.602264 8.499344 7.624576 6.84659
7
   6.963173 5.564273 7.947107 7.683914 6.196287 5.983500 8.32750
8
   6.481473 5.939874 8.484194 9.800002 5.446271 5.716552 8.55407
9
   6.328823 5.501268 8.467758 7.398992 6.380259 9.552398 7.17886
1
10 8.105572 6.245211 7.876910 6.066629 7.933171 5.989911 5.47500
1
         X8
                  X9
                          X10
   9.850833 7.676330 8.087755
   6.226144 8.468062 8.059304
   6.512540 6.487599 5.316064
   7.873135 7.734135 5.497429
   9.021292 6.705484 6.399815
   6.952712 6.894494 7.983526
   7.784801 7.797334 6.633692
   7.291071 6.759839 4.954027
   5.667684 6.769902 8.287400
10 7.846050 4.442625 6.958980
```