Homework 4

Code:

```r
# HW 4 Empirical Rule of Normal Distribution
# Inthat Sappipat 65011304

options(scipen = 999) # set the display format for large numbers

emp_rule_nor <- function(m,sd){ # create a function name emp_rule_nor to confirm
                                # the Empirical Rule of Normal which can be used
                                # for all normal distributions

  set.seed(304) # set seed to ensure that the random numbers generated
                # will be the same in each time

  x <- rnorm(10000000, m, sd) # generate random samples from the normal distribution

  proportion_one <- (sum(abs(x - m) < sd)) / 10000000 # calculate the proportion
                                                      # within the first sd

  proportion_two <- (sum(abs(x - m) < 2 * sd)) / 10000000 # calculate the proportion
                                                          # within the second sd

  proportion_three <- (sum(abs(x - m) < 3 * sd)) / 10000000 # calculate the proportion
                                                            # within the third sd

  cat("Proportion within 1 standard deviation = ", proportion_one,
      "\nProportion within 2 standard deviation = ", proportion_two,
      "\nProportion within 3 standard deviation = ", proportion_three) # show the output of
                                                                       # the proportions
                                                                       # within the first,
                                                                       # second, and third sd


}

emp_rule_nor(3,2) # run the function with mean = 3 and sd = 2
```

Result:

```
> emp_rule_nor(3,2) # run the function with mean = 3 and sd = 2
Proportion within 1 standard deviation =  0.6828441
Proportion within 2 standard deviation =  0.9545746
Proportion within 3 standard deviation =  0.9973242
```

Conclusion:

From the experiment, the proportion within 1 standard deviation is equal to 0.6828441 or 68.28 %, the proportion within 2 standard deviation is equal to 0.9545746 or 95.45 %, and the proportion within 1 standard deviation is equal to 0.9973242 or 99.73 %. Comparing these three proportions with the theoretical probabilities of 0.68, 0.95, and 0.997, I found that they are quite close. This confirms that the given normal distribution with mean and standard deviation is consistent with the Empirical Rule.