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Assignment: "Activity 1: Time Complexity"

Function: log_factorial

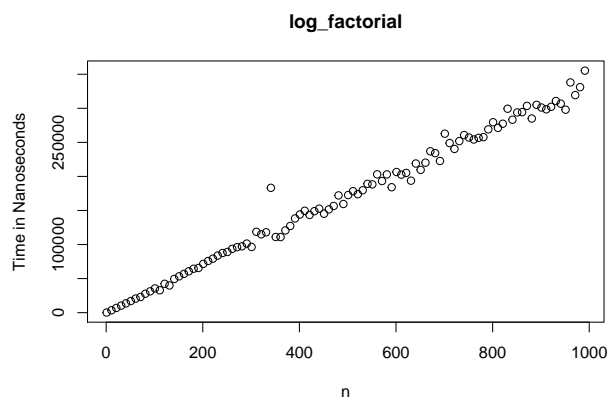
Time Complexity: $O(n \log(n))$

```
#install.packages("microbenchmarkCore")
#install.packages("microbenchmark")
library(microbenchmarkCore)
library(microbenchmark)
```

```
n <- 1000
runtimes <- c()

for(i in seq(1, n, 10)) {
  benchtimes <- microbenchmark(
    log_factorial(i))$time
  runtimes[i] <- median(benchtimes)
}

plot(runtimes,
     xlab = "n",
     ylab = "Time in Nanoseconds",
     main = "log_factorial")
```



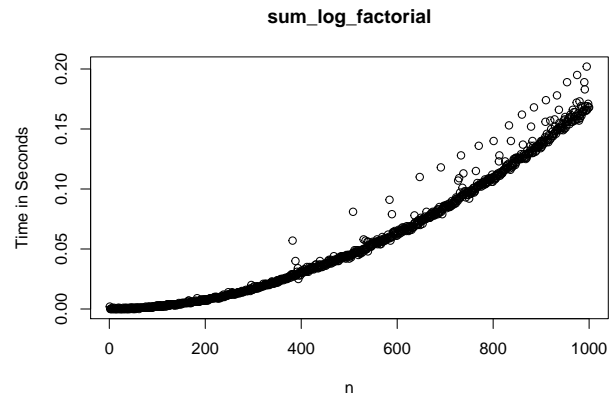
Function: sum_log_factorial

Time Complexity: $O(n^2 \log(n))$

```
n <- 1000
runtimes <- c()

for (i in seq(1, n)) {
  runtimes[i] <- system.time(
    sum_log_factorial(i))['elapsed']
}

plot(runtimes,
     xlab = "n",
     ylab = "Time in Seconds",
     main = "sum_log_factorial")
```



Function: fibonacci

Time Complexity: $O(2^n)$

```
n <- 40
runtimes <- c()

for (i in seq(1, n, 1)) {
  runtimes[i] <- system.time(
    fibonacci(i))['elapsed']
}

plot(runtimes,
     xlab = "n",
     ylab = "Time in Seconds",
     main = "fibonacci")
```

