1. Suppose X follows Bernoulli(p) distribution. Let $p = 1/3$
   (a) Simulate for $n = 100$ $X_1, X_2, X_3, \ldots X_n$ i.i.d X
   (b) Demonstrate the Law of Large numbers by plotting the sample mean $\bar{X}_n$ as a function of n.
   (c) Using `replicate` command plot 15 independent trials of the above.
   (d) Do the same when $p = 0.001$, $n = 100$, $p = 0.5, n = 100$, $p = 0.99$ on different plots
2. We wish to compute
$$\int_a^b f(x)dx$$
using the Law of Large numbers.
   (a) Generate samples of $X_1, X_2, \ldots X_n$ i.i.d. Uniform (a, b). Justify
$$(b-a)\sum_{i=1}^{n}\frac{f(X_i)}{n} \approx \int_a^b f(x)dx$$
   (b) Write an `R`-code to estimate the $\int_0^7 \frac{16+\sin(x)}{x^2+4}dx$ using the procedure described in the previous part with $n = 400$.
   (c) Repeat the estimate 100 times and find the mean of these 100 simulations.
   (d) Use the `integrate` command in `R` to evaluate the integral. Compare the two answers.