Homework 2

Due March 8,2022

Problem 1

Recall that the Kolomogorov-Smirnov One-Sample Statistic $D_n = \sup_x |F_X(x) - \hat{F}_n(x)|$ is distribution free ($\hat{F}_n$ is the empirical CDF). Suppose $n = 100$ and the observed D_n is 0.04. Would you reject the null hypothesis $H_0 : X_1, ..., X_n \sim F_X$ at level $\alpha = 0.05$? Write a simulation to justify your answer.

Problem 2

Use the following r code to generate 50 random numbers from Cauchy distribution

```
set.seed(2)
d <- rcauchy(50)
```

Use a QQ plot to see how good (or bad) your data fits a normal distribution. Hint: Plot the graph $(F_0^{-1}(p), \hat{F}^{-1}(p))$ where F_0 is the CDF of $N(0,1)$ and $\hat{F}(x)$ is the empirical CDF. You can use

```
qnorm
```

to compute F_0^{-1}.

Problem 3

Use a test discussed in class to test whether the following sequence is random at level $\alpha = 0.1$

$$A, B, B, A, A, A, A, A, A, B, A$$

Use simulation to justify your answer.