

Assignment 1

Problem 1. Consider the following square domain $D = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq 1\}$. Then do the following.

- Generate 10000 random points inside D .
- Categorize the points based on whether they are inside the circle $x^2 + y^2 = 1$ or outside and then plot with proper markers.
- Among these points, suppose m points are inside the unit circle. Then find $\frac{4m}{10000}$.

Problem 2. Store the following characters to a variable:

“Suppose that a number of miles that a car can run before its battery wears out is exponentially distributed with an average value of 10,000 miles. If a person desires to take a 5000-mile trip, what is the probability that she will be able to complete her trip without having to replace her car battery? what can be said when the distribution is not exponential?”

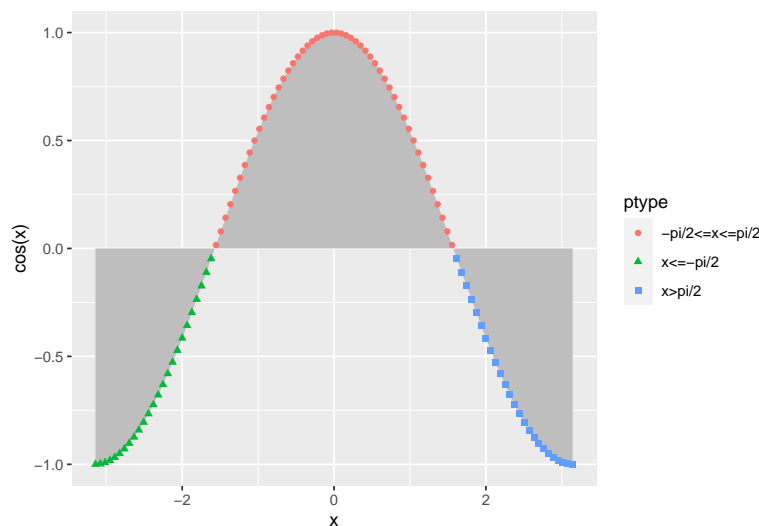
Then extract all words starting with the letter `w`.

Problem 3. Create a data frame in R that contains the following data of 10 students:

- First name (use names of your choice)
- Gender (five female and five male; indicate with F and M)
- Age (exactly five with above 18)
- CGPA (choose a value from 1 to 10)
- BATCH (use: 2019, 2020, or 2021)

Save the data frame in a ‘.csv’ file. Now write a one line code to find the female students of BATCH 2019 with a CGPA higher than 6.

Problem 4. Regenerate the following figure. Hint: You may use functions from the package `ggplot2` to draw the points, shaded region etc.



Problem 5. Vary ν between $[1, 10]$ to create an animated plot of the following function f in the domain

$x \in [-10, 10]$.

$$f(x) = \frac{\Gamma\left(\frac{\nu+1}{2}\right)}{\sqrt{\nu\pi} \Gamma\left(\frac{\nu}{2}\right)} \left(1 + \frac{x^2}{\nu}\right)^{-\frac{\nu+1}{2}}$$

Instructions

- Submit exactly one '.r' file associated with each question (five in total).
- Use appropriate comments to describe the steps in the code. (Do not use more than 5 lines of comments for each question.)
- Each question contains 4 points.
- Those who are uploading from Mac, make sure there are no other hidden files.
- Do not discuss the solution with your friends; it increases the percentage of similarity. If found similar with higher than 70%, both the copy will be entitled with zero points.