

Question set 3

1. We have a random sample of size 101 from a $N(\mu, 1)$ population, where $\mu \in \mathbb{R}$ is unknown. We want to estimate μ . There are two contending estimators: the sample mean and the sample median (i.e., the centralmost value after you order the random sample). We want to approximate the standard errors of these estimators. Do this using simulation for $\mu = 10$ and $\mu = 20$.

[Hint: The `median()` function in R computes median.]

2. A point, P , is chosen at random on the circumference of the unit circle centered at the origin. All points are equally likely. Let $(X, 0)$ be the point where the tangent hits the x -axis. Take $X = 0$ if the P is at $(0, -1)$ or $(0, 1)$. Use simulation to form an idea about the distribution of X . Is the distribution normal? Answer this question by overlaying the best normal PDF on the histogram, and then visually ascertaining the fit.
3. The same set up as above. Find (using simulation) two numbers L and U such that X lies between them with 90% probability. The smaller is $U - L$, the happier I would be. Also find (using simulation) the probability that X exceeds 5.