Project 1

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1 Effective Sample Size

1.1 Computing θ

In this section, we examine the effectiveness of picking different $g(x)$ to compute $\theta = \int \sqrt{x^2 + y^2}\pi(x, y)dxdy$

- For $\hat{\theta}_1$, we will draw from $\pi(x, y)$ directly.
- $\hat{\theta}_2$ will be drawn from g(x,y) a bivariate gaussian with parameters $\mu = (0, 0)$ and $\sigma_0 = 1$ We assume independence between x and y.
- $\hat{\theta}_3$ will be drawn from g(x,y) a bivariate gaussian with parameters $\mu = (0, 0)$ and $\sigma_0 = 1$ We assume independence between x and y.

Comparing between $\hat{\theta}_2$ and $\hat{\theta}_3$, I believe that $\hat{\theta}_3$ will converge more quickly to θ. This is because both models are drawn from a distribution whose mean is not the true mean $\mu = (2, 2)$ meaning the masses of g and pi are not distributed in the same points. It is more likely for us to draw samples close to this the mass of π from g_3 because of the larger standard deviation.

We clearly see this when plotting the estimated $theta$ for different g distributions. We see that $\hat{\theta}_3$ converges to $\hat{\theta}_1$ baseline faster than $\hat{\theta}_2$ as n increases.

1.2 effective samples size

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