

Problem 5: π Day Special: Probability on a π -Disk

Two points P and Q are chosen independently and uniformly at random inside a circle of radius π centered at the origin of the cartesian plane. Let D be the distance from the center of the circle to the midpoint of the segment PQ . Find the expected value $E[D^2]$.

As always, show your work, fully explain and justify your answer. A solution mainly obtained by computers or calculators will not be accepted.

Posting Date 3/14/2026. Submit solutions to Noah Aydin, Mathematics Department, RBH 319 by e-mail or hard-copy by noon on Sunday, March 22, 2026. An email submission must be a single pdf file. Hard copy submissions must be dropped in the file holder at my office door (Hayes 319) and must include a time stamp.