

**[nex5] Random chords (Bertrand's paradox)**

Consider a circle of unit radius and draw *at random* a straight line intersecting it in a chord of length  $L$

- (a) by taking lines through an arbitrary fixed point on the circle with random orientation;
- (b) by taking lines perpendicular to an arbitrary diameter of the circle with the point of intersection chosen randomly on the diameter;
- (c) by choosing the midpoint of the chord at random in the area enclosed by the circle.

For each *random choice* determine the probability distribution  $P(L)$  for the length of the chord and calculate the average length  $\langle L \rangle$ .

**Solution:**