Problem set 3 - Geometric probability

1. A rod of lenght l is broken at two randomly chosen points. Find the probability that the obtained segments can form a triangle.

2. A point A is randomly picked from the inside of a rectangle of sides 1 and 2. Find the probability of the following events:

   (a) The distance from A to the nearest diagonal is at most x.
   (b) The distance from A to each side is at most x.

3. (*Bertrand paradox*) Consider an equilateral triangle inscribed in a circle. Suppose a chord of the circle is chosen at random. What is the probability that the chord is longer than a side of the triangle? Consider 3 different methods: the "random endpoints"method, the "random radial point"method and the "random midpoint"method.

4. Consider a segment AB of length ℓ. Points M and N are chosen randomly within this segment. What is the probability that point M is closer to point N than it is to point A?

5. Find the probability that three randomly chosen segments of length no more than 1 can form a triangle.