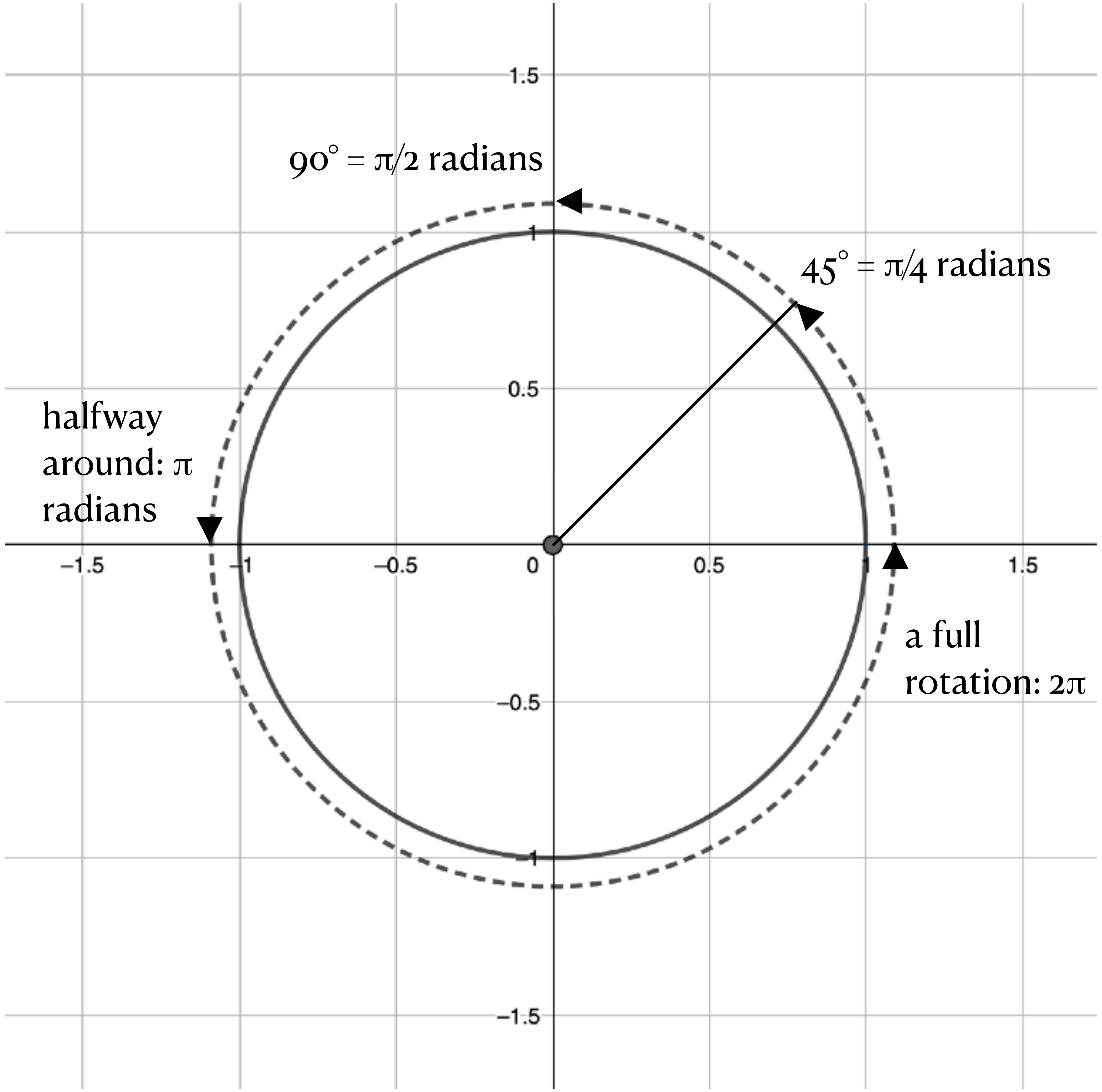
Radians: A Refresher

using π to measure angles

this is the "unit circle" because it has a radius of 1

the diameter is 2, so the circumference is 2π



you can express angles in terms of how far around the unit circle you are, starting on the right (the x axis)

so "all the way around," i.e. 360 degrees, is 2π radians, and smaller angles are some proportion of 2π

this lil guy pops up in weird places

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \cdots = \frac{\pi}{4}$$

this is an "infinite sum" meaning that you can get as close as you want to the actual value of π/4 if you add up enough terms on the left. it's often attributed to Leibniz but is actually a special case of a formula discovered by the Indian mathematician Madhava in the 14th century!

$$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots = \frac{\pi^2}{6}$$

ditto "infinite sum". figuring out the value of this sum is called "the basel problem" and was first solved by... you guessed it... ya boy Euler

$$\left(\frac{2}{1} \cdot \frac{2}{3}\right) \cdot \left(\frac{4}{3} \cdot \frac{4}{5}\right) \cdot \left(\frac{6}{5} \cdot \frac{6}{7}\right) \cdot \cdots = \frac{\pi}{2}$$

an infinite product! as above, but with multiplication. from John Wallis in 1656

Buffon's needle problem: if we have a floor made of parallel strips of wood, each the same width, and we drop a needle as long as the strips are wide onto the floor, the probability that the needle will lie across a line between two strips is 2/π