Name:	Date:	Period:

Lab17: Random Walk in 2-D, Part Three

- Initialize 1000 points at the center of your window.
- At each time step repeat 1000 times...
  - Flip a four-sided coin, then move a point up or down or left or right.
  - The idea is to do this *independently* for each of the 1000 points.
  - So, one point's movement does not affect any other point's movement.
- At each time step print out two numbers:
  1. The average distance of a point from the center.
  2. The standard deviation of the distance of a point from the center.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$AVG = \mu = \frac{\sum d}{NUM}$$

$$S.D. = \sigma = \sqrt{\frac{\sum (d - AVG)^2}{NUM}}$$

- Attach three plots of a normal curve showing early, middle, and late distributions.
- Be careful since $\sigma = 0$ at the first step.
- Since distance cannot be negative this model is somewhat inaccurate (the left tail is cut off in reality). If the points are initialized along the circumference of a large circle then this error will mostly disappear. Shown below, the function f tells us the probability of finding a point at a distance d from the center. We want to plot d versus $f(d)$.

$$f(d) = \left(\frac{1}{\sigma\sqrt{2\pi}}\right) \cdot e^{\left(-\frac{(d-\mu)^2}{2\sigma^2}\right)}$$