MONT 107N – Understanding Randomness
Study/Discussion Questions on Mlodinow, *The Drunkard's Walk*
January 20, 2010

Note: You can also view a video of a public lecture by Leonard Mlodinow on the topics discussed in *The Drunkard's Walk* given in May 2009 at the Perimeter Institute for Theoretical Physics in Waterloo, Canada. See link on course homepage.

Questions

1. Are "hot" streaks in real life situations such as the selection of movie projects to "green-light" by Hollywood executives, performance by pro athletes, or returns generated by investment managers *only* the result of superior skill, talent, or better information? Are "cold" streaks *always* an indication of decline in skill, lack of talent, etc.? What does Mlodinow say about this? How does this relate to the notion of *regression to the mean* we discussed last term? How does it connect with the Law of Large Numbers from Chapter 16 of Freedman-Pisani-Purves?

2. What is *availability bias* in memory? How does it skew our perception of probabilities of events in real life? If one subscribes to the theory of evolution, might this sort of *emotional component of memory* have confered some fitness advantage?

3. What are the points that Mlodinow is making in the discussion of the Califonia court case *People v. Collins* and the claims for the reliability of DNA evidence in trials?

4. What major result in the theory of probability was first established by Jakob Bernoulli? Try to state it as precisely as you can.

5. What is "Benford's Law?"

6. Is there a "law of small numbers?" What does this phrase refer to? How does this relate to question 2 above?

7. Who was Thomas Bayes and what contributions did he make to probability theory?

8. If a medical diagnostic test for disease D is described as 90% effective, what does this usually mean? If you are given the test and it indicates you have D, is the chance you have D the 90%?

9. One very prominent medical development of the past 30% years or so is the increased prevalence of regular diagnostic testing for indicators of conditions such as heart disease, breast, prostate, and cervical cancer, etc. as part of routine medical checkups. What are some of the practical implications of this for our health care system?

10. What is the *confirmation bias*? How does it lead to errors in interpreting results of chance processes?

11. Was Bill Gates supremely insightful about the development of computer software like Windows, Office, etc. Or was he just lucky that he was at the right place at the right time?

12. Would people in the US still fervently believe in the American Dream if they understood that hard work alone may not be enough? If the connection between actions and results is not as direct as we sometimes want to believe because of the influence of randomness, what consequences might there be for politics and social mobility? Is

there such a thing as a pure meritocracy? Do society's elite have a legitimate claim that they are there because of their talent and hard work?