

Essay 1

Math 309

Fall 2016

Deadline: 12N Friday 30 September

Late deadline: 14 October

Writing

- Select **one** of the following items and write a 600-700 word essay in response. Address the issues posed, but feel free to extend their scope.
 - Using *concise and clear sentences*, incorporate symbols and illustrations into your text. Have an audience in mind. Focus on *developing* an explanation or argument. Using specific examples to illustrate a general idea or claim is often a helpful tactic. What are you trying to establish and how are you're trying to establish it?
 - Writing well is difficult and can be painful. For writing assistance, consult the style and content guide at the class website. There's no required stylistic format; writing can range from technical to literary.
 - Submit **double-spaced in hard copy**.
- 1) Does the concept of complexity require a complex definition? Can the concept of simplicity admit a simple characterization? Are complexity and simplicity mutually exclusive properties? A sequence of coin flips appears to be a fairly simple process. Is there a sense in which it's also complex?
 - 2) Perhaps the standard model of a complex system involves emergent global properties arising from interactions based on local rules. Using a real or imagined system, discuss and illustrate how particles or agents that are far apart—in some sense that's meaningful relative to the system at hand—can exert an influence on one another. How does such an effect play into the properties and structures that emerge?
 - 3) Frequently, an average of quantities—speeds, rainfall, heights—doesn't refer to something real. (Among a group of people, there needn't be someone whose height is the average height.) Describe a situation—it can be physical or virtual—in which an average of some set of quantities corresponds to a real physical condition or state. Be careful to quantify the constituent parts and elaborate on how the average value of these quantities constitutes the relevant condition or state.
 - 4) Carefully discuss how a dynamical process can be both deterministic *and* unpredictable. Using a specific example might be a good means of exposition.
 - 5) Compare the dynamical behavior of a financial market to that of the weather. Are either predictable? Are there constraints on their predictability? Are they deterministic? Do they tend to a stable equilibrium state?