MATH 250: DAILY PREPARATION
for Tuesday 02/23

Overview

As we continue our study of induction, we turn our attention next to the notion of *recursion* and, in particular, *recursively defined sequences*. A sequence is a simple mathematical object – a list of numbers – and a recursively defined sequence is an elementary idea. For example, we could let S be the sequence defined by the rule $s_1 = 3$ and for all $n > 1$, $s_n = 2s_{n-1} + 1$. This tells us that $s_2 = 2s_1 + 1 = 2 \cdot 3 + 1 = 7$. We could similarly find s_3, s_4, and so on. A natural question is: can we find a formula for s_n that depends only on n (and not on s_{n-1})? This specific question is a good one for you to ponder, as well as to think about how this question fits generally with the kinds of work we'll undertake in Section 4.3 of the text.

Basic learning objectives

These are the tasks you should be able to perform with reasonable fluency **when you arrive at our next class meeting**. Important new vocabulary words are indicated *in italics*.

- Apply the definition of a recursive sequence to list several different elements in the sequence.
- Know the definition of the Fibonacci sequence and at least the first 12 elements in that sequence.

Advanced learning objectives

In addition to mastering the basic objectives, here are the tasks you should be able to perform in the near future **with practice and further study**:

- Understand how to apply inductive arguments in a wide range of mathematical settings, including to prove inequalities, formulas for derivatives, statements regarding divisibility and congruence, recursively defined sequences, and more.
- Use correct and proper notation with predicates and variables to write valid induction proofs.

Resources

Reading: Read pages 200-203 (much of which is the preview activities you'll respond to as part of today's Questions)

Watching: Here are some additional resources that have been developed to support your learning:

- Screencast 4.3.1: http://gvsu.edu/s/tj
- Screencast 4.3.2: http://gvsu.edu/s/tk

Questions

Respond to the following questions on separate paper, as explained in the document that describes guidelines and expectations for daily preparatory assignments. You should be prepared to show me your responses at the start of class; I will review your work briefly sometime before the end of class.

1. Complete Preview Activity 1, showing your work for all questions/parts on your paper.
2. Complete Preview Activity 2, again showing your work for the questions posed there.
3. Why is mathematical induction required to prove a statement such as "for all natural numbers n, $f_1 + f_2 + \cdots + f_n = f_{n+2} - 1$"? (Here, "$f_n$" stands for the nth Fibonacci number.)