

# Chapter 9

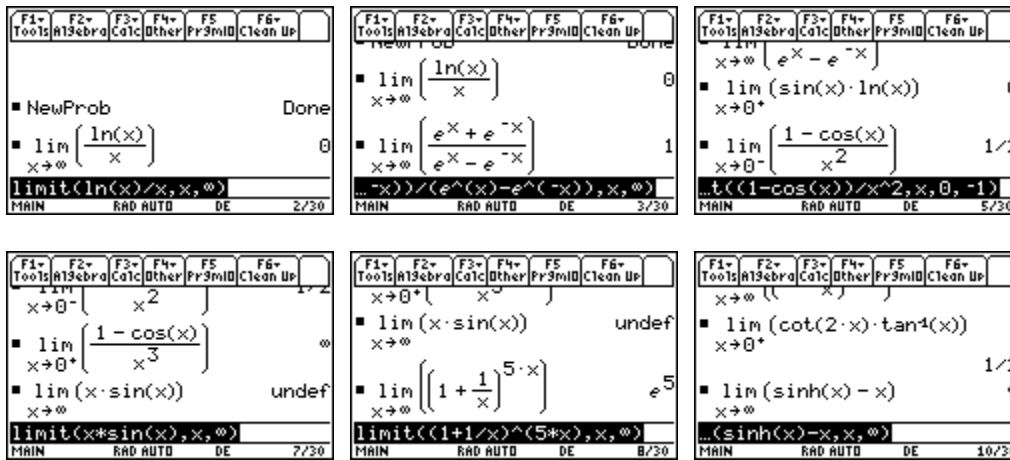
## Infinite Limits, Improper Integrals, Series

- §1. Symbolic Infinite Limits
- §2. Improper Integrals
- §3. Sequences and Series
- §4. Sequence Graphing

The activities in this chapter present symbolic, numerical, and graphical activities involving limits, improper integrals, sequences, and series. This corresponds to Chapter 9 of the text *Calculus with Early Vectors*, by Phillip Zenor, Edward Slaminka, and Donald Thaxton, Prentice Hall, 1999.

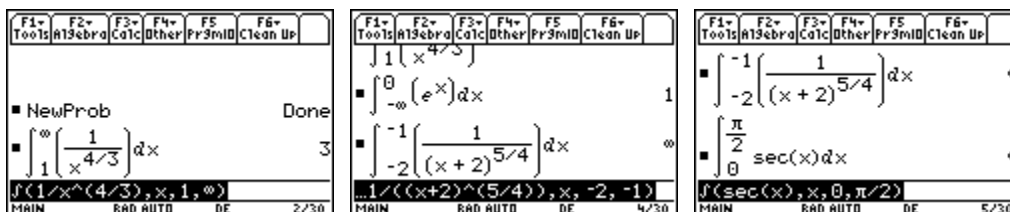
### 1. Symbolic Infinite Limits

The TI-89 can handle many limits involving infinity. It is not a good idea to jump to conclusions about the value for infinite limits based upon numerical evidence. However the same theorems you are learning about how to handle infinite limits can be implemented in the symbolic part of the calculator. Notice that you can find “∞” on the keyboard, and infinity is a possible output if you have the Exact/Approx mode set to either AUTO or EXACT.



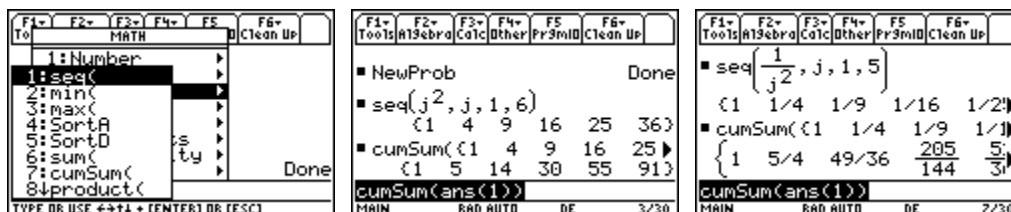
### 2. Improper Integrals

Since the evaluation of improper integrals generally involves a symbolic integration followed by some evaluation of an infinite limit, it is not a surprise that the TI-89 can do many of these.

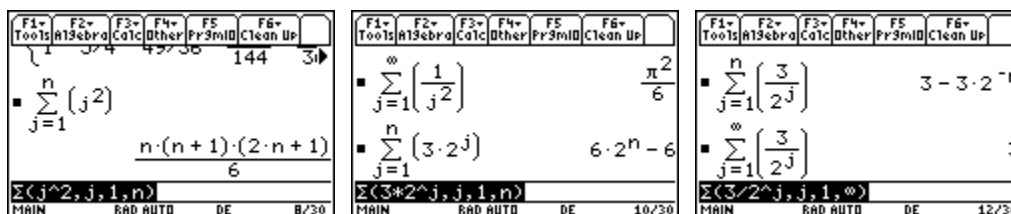


### 3. Sequences and Series

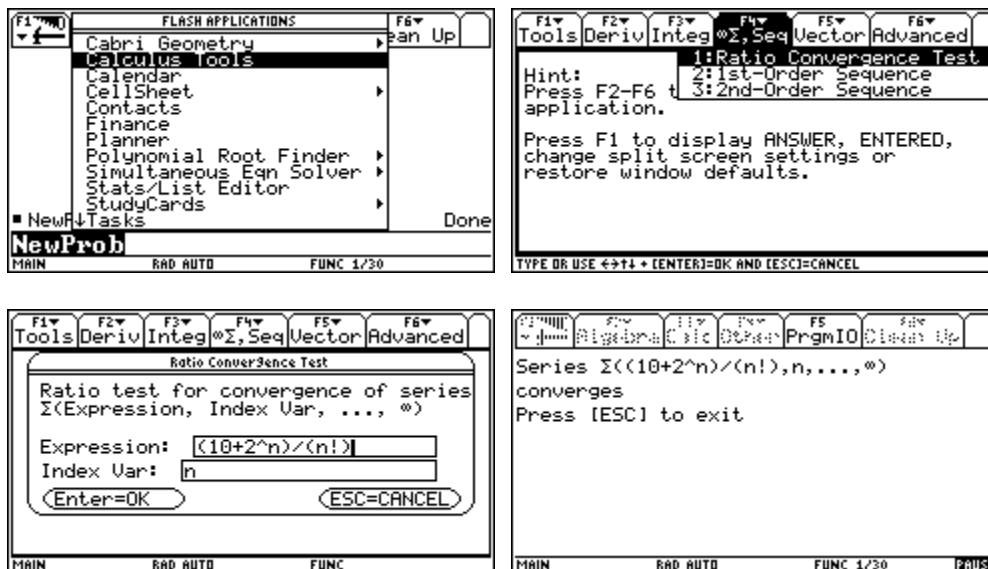
It is possible to work with *finite* sequences and series using lists. This may be enough to recognize patterns.



The F3 Calc command 4:Σ( sum allows some symbolic results. Some special infinite series can be evaluated.

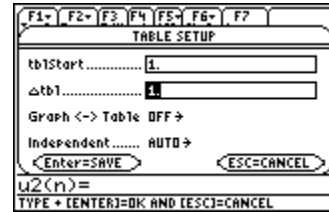
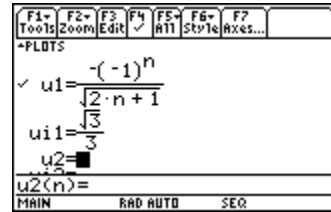
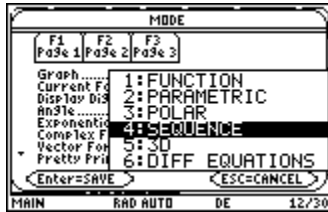


The ability of the calculator to evaluate symbolic limits means it will be useful for some of the limits needed in the ratio test for power series. This has been further facilitated in the Calculus Tools flash application (free from <http://education.ti.com>). You will not get much credit using only the application (because your instructor will want to see that you understand the ratio test), but you can check your work with this flash application.

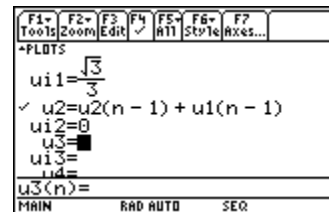
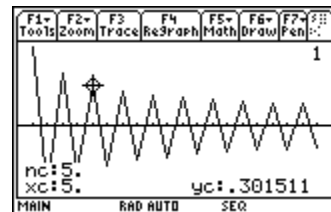
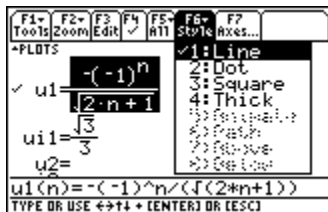
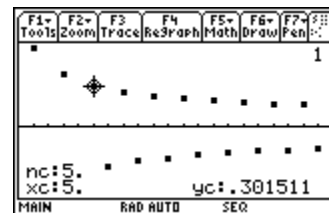
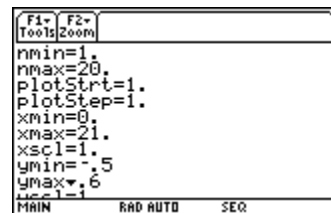
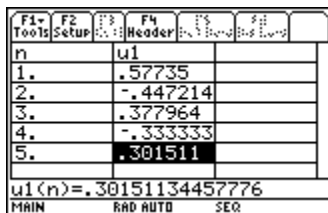


## 4. Sequence Graphing

The sequence graphing mode allows still further ways to study and understand sequences and series.

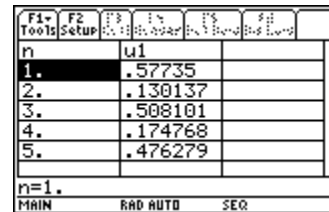
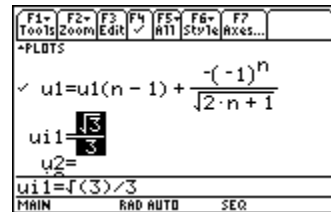
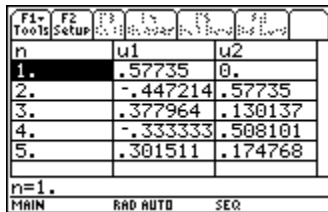


F6 Style 3: Square (default)

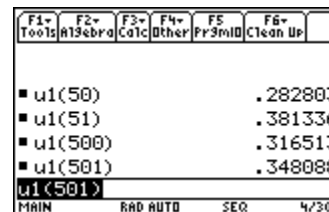
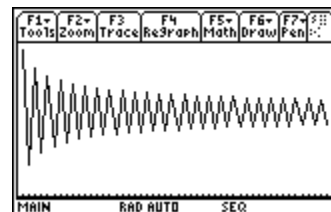
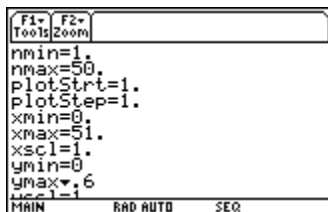


F6 Style 1: Line

Second sequence is a partial sum of the first, off by one index.



Alternate way to get only partial sums, correct index.



Alternate way with Line Style

Evaluation of alternate way in HOME screen