

*Column of Books*¹

Consider the stack of identical books pictured in Figure 1.

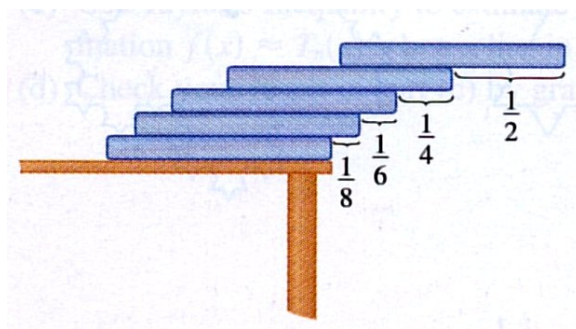


FIGURE 1. A precarious stack of books.

Notice the top book on the stack extends completely beyond the footprint of the bottom book. Show that given enough identical books one can create a stack such that the top book extends as far to the right of the bottom book as you want.

Here are some hints to get you started:

- Define the sequence

$$(1) \quad \left\{ \frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8} \right\}$$

as the **overhang sequence**. What would the sequence be if we add another book? Another two books? For n books?

- Compute the center of mass of the stack of books in Figure 1. What does the center of mass tell about the stability of the stack? You may assume that all books are of uniform size, density and have length 1.
- Compute how far the top book extends beyond the footprint of the bottom book for the length n overhang sequence. Can it continue like that forever? Be specific in your reasons.

Note About Lab 3: In this lab, the focus is on writing up your solution (and of course, the mathematics should be correct!). Your audience is this class, so one way to think about how to write up your solution is to talk through the solution with your lab partner. The figure file is on our class website. You may or may not use Maple (again, the focus is on the writing!).

¹adapted from *Calculus: Early Transcendentals*, 4th ed. Stewart, pg 780