# Extra Credit Assignment 7

**Due Friday, April 2, 11:59 PM**

The natural log function ln is kind of crazy. For example, we don't know how to compute ln(2) exactly by hand. In this extra credit assignment, we'll see how Riemann sums can help us approximate the value of ln(2).

(a) Using a calculator, find the value of ln(2) to 10 decimal places.

(b) Without using a calculator, tell me what the value of ln(1) is.

(c) Tell me why the integral $\int_1^2 \frac{1}{x}\,dx$ tells you what ln(2) is.

(d) Now, let's *approximate* the integral $\int_1^2 \frac{1}{x}\,dx$ using Riemann sums. Using the lefthand rule, compute the Riemann sum approximating this integral for the values of $n$ indicated in the following table:

Table 1: default

| $n$ | $\sum_{i=0}^{n-1} \frac{1}{x_i}\frac{1}{n}$ |
|---|---|
| 1 | 1 |
| 2 | $\frac{1}{2}(1+\frac{2}{3}) = 0.8333333333$ |
| 3 | $\frac{1}{3}(1+\frac{3}{4}+\frac{3}{5}) = 0.7833333333\ldots$ |
| 4 | |
| 5 | |
| 10 | |
| 20 | |

(I have filled in the first three rows for you. You may use a calculator for the other rows.)

(e) According to your table, as $n$ grows bigger, how do the values of your Riemann sums compare to the value ln(2) that your calculator told you?

(f) Based on your experience (be honest) how do you feel about Riemann sums as a way to approximate numbers like ln(2)?