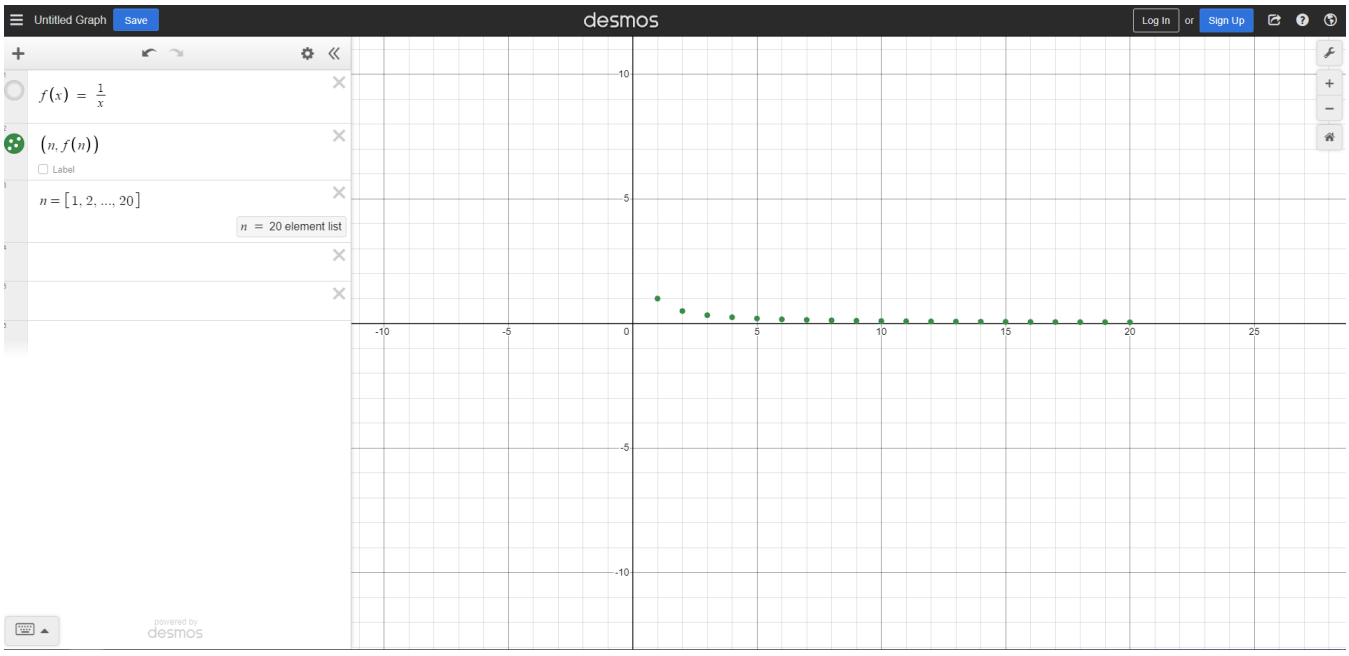
Part I: (due at the beginning of class Friday, March 15)

In Sequence News Today: you can graph sequences in Desmos (and on graphing calculators, too, but it's easier in Desmos, unsurprisingly).

- First, type in the related function (the function that's defined for all real numbers between 1 and ∞ as opposed to the sequence that's just defined for the natural numbers $1, 2, 3, \ldots$); e.g., if you're investigating the sequence
$$(a_n) = \left(\frac{1}{n}\right) = \left(1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\right),$$
the related function is $f(x) = \frac{1}{x}$, which is defined for all real numbers (other than 0). Turn off the graph of the function by clicking on the colored circle to the left of the function entry.
- For the sequence, we just want the points that occur at x-values that are natural numbers, so for your next Desmos entry, type in $(n, f(n))$.
- For your third Desmos entry, type in $n = [1, \ldots, 20]$ to display the first 20 points of the sequence. Feel free to change the last number to whatever number of points you want to display. (Note: if you want, you can instead change the last number to a variable such as N and then define $N = 20$—or whatever number—in another Desmos entry.)

Here's a screenshot of what this looks like for the sequence $(a_n) = \left(\frac{1}{n}\right)$:



Reading Questions

Graph each of the following sequences in Desmos and use the graphs to describe the behavior of the sequences as $n \to \infty$: does it look like there's a specific number the terms of the sequence are heading

toward (if so, what is that number), or is something else happening (if so, describe what is happening)?

1. $(a_n) = (3 + (-1)^n)$
2. $(b_n) = \left(\dfrac{2n}{1+n}\right)$
3. $(c_n) = \left(\dfrac{n^2}{2^n - 1}\right)$

Remember that what you turn in for Part I should have 3 parts, as mentioned in the syllabus:

(a) Your responses to the reading questions.

(b) Your own questions/comments on the reading.

(c) The amount of time you spent on Part I (including the time spent reading/watching).

Part II: Exercises

No Part II this time.

Part III: Homework Problems (due Wednesday, March 13 at the beginning of class)

Review the guidelines and Sample Homework in the syllabus to make sure your Part III solutions follow them.

1. We've determined that $\displaystyle\int_1^\infty \frac{1}{x^p}\,dx$ converges if $p > 1$ and diverges if $p \leq 1$.
   (a) Now decide what happens if the limits of integration are 0 and 1 instead; i.e., for what values of p does $\displaystyle\int_0^1 \frac{1}{x^p}\,dx$ converge and for what values of p does it diverge?
   (b) Using your newfound knowledge from part (a), determine whether each of the following integrals converge or diverge by employing the Comparison Test (which works on finite intervals as well as infinite intervals).
      i. $\displaystyle\int_0^1 \frac{\sec^2 x}{x\sqrt{x}}\,dx$
      ii. $\displaystyle\int_0^\pi \frac{\sin^2 x}{\sqrt{x}}\,dx$