Math 8
Winter 2020

Preliminary Homework
Assigned Wednesday, January 8

Note: Preliminary homework is always graded credit or no credit. **You get full credit for completing the assignment, whether or not your answers are correct, as long as your work shows you have thought about the problem.** The purpose of preliminary homework is to start you thinking about the topic of the next class.

You may use your preliminary homework for in-class activities with your classmates. You should be sure to think about these questions so you will be prepared.

Preliminary homework is always due at the *beginning* of the next class.

In the last preliminary homework, you showed the n^{th} degree Taylor polynomial $T_n(x)$ for the function $f(x) = \dfrac{1}{1-x}$ centered at the point $a = 0$ is $T_n(x) = \displaystyle\sum_{k=0}^{n} x^k$.

We are interested in the limit, for particular values of x, which you may have seen (or can see from the Day 2 notes) is the actual value $\dfrac{1}{1-x}$ if $|x| < 1$, and does not exist if $|x| \geq 1$. We may write this limit as an infinite sum,

$$\sum_{k=0}^{\infty} x^k = \lim_{n\to\infty} \left(\sum_{k=0}^{n} x^k \right) = \begin{cases} \frac{1}{1-x} & \text{if } |x| < 1; \\ \text{undefined} & \text{if } |x| \geq 1. \end{cases}$$

Use this formula to find the following infinite sums.

1. $\displaystyle\sum_{k=0}^{\infty} \frac{1}{3^k}$.

2. $\displaystyle\sum_{k=0}^{\infty} \frac{4}{3^k}$. (Hint: You can factor the 4 out of the sum.)

3. $\displaystyle\sum_{k=2}^{\infty} \frac{1}{3^k}$. (Be careful; this sum doesn't start at $k = 0$.)