Math 31 – Workshop #20

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1. Determine whether the sequence converges or diverges. If it converges, find the limit.

   (a) $\left\{\dfrac{(-1)^n\sqrt{n}}{\ln(n+1)}\right\}$

   (b) $\left\{\dfrac{5^n+3^n}{n!+3(5^n)}\right\}$

   (c) $\left\{\dfrac{n!}{(n+1)!+n^2}\right\}$

   (d) $\left\{\cos\left(\pi\cdot\dfrac{2^n+n^3}{2^{n+1}}\right)\right\}$

2. Consider the sequence $2, 2\frac{1}{2}, 2\frac{1}{3}, 2\frac{1}{4}, 2\frac{1}{5}, \ldots$.

   (a) What is the sum of the first three terms?

   (b) How many terms could you add so that the sum is bigger than 8?

   (c) How many terms could you add so that the sum is bigger than 20?

   (d) How many terms could you add so that the sum is bigger than 500?

   (e) Do you think we can add enough terms so that the sum is as big as we want? Why or why not?

3. Consider the sequence $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \ldots$.

   (a) Compute the following.

   Sum of the first two terms =

   Sum of the first three terms =

   Sum of the first four terms =

   Sum of the first five terms =

   Sum of the first six terms =

   Sum of the first seven terms =

   (b) Looking at the pattern above, what number does it appear those partial sums are approaching?

4. Suppose there is a sequence $a_1, a_2, a_3, a_4, \ldots$, and each one of the terms is bigger than $\frac{1}{3}$.

   (a) How many terms could you add to be sure the sum was bigger than 5?

   (b) How many terms could you add to be sure the sum was bigger than 27?

   (c) Do you think we can add enough terms so that the sum is as big as we want? Why or why not?