Math 131 Day 31

My Office Hours: M & W 12:30–2:00, Tu 2:30–4:00, & F 1:15-2:30 or by appointment. **Math Intern** Sun: 12–6pm; M 3-10pm; Tu 2–6, 7–10pm; W and Th: 5-10 pm in Lansing 310. Website: `http://math.hws.edu/~mitchell/Math131S13/index.html`.

Practice

Read 8.3 about series and begin 8.4. Also read the notes online, which are more condensed and focus on what we will use.

1. **a)** Read about Geometric series and try page 553 #7, 11, 15, 19, 21, 23, 25 (watch the starting index), 29, 35, 37, and 39.

b) Try pge 554 #47, 49, 51.

2. Know these key limits:

a) $\lim_{n\to\infty}\left(1+\frac{k}{n}\right)^n = e^k$ **b)** $\lim_{n\to\infty}\sqrt[n]{n} = \lim_{n\to\infty} n^{1/n} = 1$

c) $\lim_{n\to\infty}\frac{n!}{n^n} = 0$ **d)** $\lim_{n\to\infty}\frac{n^n}{n!} = +\infty$ **e)** $\lim_{n\to\infty} r^n = \begin{cases} 0, \text{if } -1 < r < 1 \\ 1, \text{if } r = 1 \\ \text{diverges, otherwise} \end{cases}$

Hand In

Finish WeBWorKDay 30 due today and begin `Day 31` due Sunday night.

1. Use standard algebra and Key Limits to evaluate the limits of the following sequences. You should not have to use l'Hopital's rule.

a) $\left\{\left(1-\frac{6}{n}\right)^{n/3}\right\}_{n=1}^{\infty}$ **b)** $\left\{n^{4/n}\right\}_{n=1}^{\infty}$ **c)** $\left\{4^n 7^{-n}\right\}_{n=1}^{\infty}$ **d)** $\left\{(-1)^{-n}\right\}_{n=1}^{\infty}$

2. Carefully determine $\lim_{n\to\infty}\sqrt[n]{n+2}$ if it exists. **Make sure to use proper mathematical grammar.**

3. (See the example that we did in class on the back.) Someone takes a maintenance medication: 20 mg once every 24 hr. Every 24 hr two-thirds of the drug is eliminated from the blood stream; so one-third remains.

a) Find the recurrence relation for the sequence $\{d_n\}_{n=1}^{\infty}$ where d_n is the amount of the drug in the bloodstream immediately after dose n.

b) Write out the first four terms of the sequence Does the sequence appear to be monotonic?

c) Find the limit L of the sequence using the method we used in class (see page 543).

4. Even if we don't get this far: **Carefully read** about Geometric Series on pages 550–552. Then use Theorem 8.7 to determine the sums of these series, if they exist.

a) $\sum_{n=0}^{\infty}\left(\frac{5}{7}\right)^n$ **b)** $\sum_{n=0}^{\infty} 4\left(\frac{-2}{5}\right)^n$ **c)** $\sum_{n=0}^{\infty} 6\left(\frac{5}{3}\right)^n$

5. Determine $\int_{-2}^{1}\frac{2}{x^2+5x+6}\,dx$. Is it improper? **Make sure to use proper mathematical grammar.**

6. Only if we get this far: Use the partial fractions from the previous problem and "telescoping" to determine the sum of $\sum_{k=0}^{\infty}\frac{2}{k^2+5k+6}$.

Using Sequences

Here's how drug doses work. Someone takes a maintenance medication: 20 mg once every 24 hr. Every 24 hr half the drug is eliminated from the blood stream.

a) Find the recurrence relation for the sequence $\{d_n\}_{n=1}^{\infty}$ where d_n is the amount of the drug in the bloodstream immediately after dose n.

b) Does the sequence appear to be monotonic? Bounded? Does it converge?

c) Find the limit L of the sequence. This represents the maximum amount in the blood stream in the long run.