Center for Academic Resources in Engineering (CARE)
Peer Exam Review Session

Math 231 — Calculus II

Midterm 3 Worksheet

The problems in this review are designed to help prepare you for your upcoming exam. Questions pertain to material covered in the course and are intended to reflect the topics likely to appear in the exam. Keep in mind that this worksheet was created by CARE tutors, and while it is thorough, it is not comprehensive. In addition to exam review sessions, CARE also hosts regularly scheduled tutoring hours.

Tutors are available to answer questions, review problems, and help you feel prepared for your exam during these times:

Session 1: Nov 2, 4-5:20pm Bella and Hriday

Can't make it to a session? Here's our schedule by course:

https://care.grainger.illinois.edu/tutoring/schedule-by-subject

Solutions will be available on our website after the last review session that we host.

Step-by-step login for exam review session:

1. Log into Queue @ Illinois: https://queue.illinois.edu/q/queue/844
2. Click "New Question"
3. Add your NetID and Name
4. Press "Add to Queue"

Please be sure to follow the above steps to add yourself to the Queue.

Good luck with your exam!

1. Determine whether the series converges or diverges:

$$\sum_{n=1}^{\infty} \frac{n^2+3}{n^3+3}$$

2. Determine whether the series converges or diverges. Note that $\lim_{n\to\infty}(1+\frac{1}{n})^n = e$.

$$\sum_{n=1}^{\infty} \frac{n!}{n^n}$$

3. Determine whether the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{5^n}{n+6^n}$$

4. Determine whether the series converges or diverges.

$$\sum_{n=1}^{\infty} (\frac{n^2}{2n^2+5})^n$$

5. Determine whether the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{17n^2}{3n^4-1}$$

6. Determine if the following series converges absolutely, converges conditionally, or diverges.

$$\sum_{n=1}^{\infty} \frac{(2n+1)(-2)^n}{n!}$$

7. You are given the power series

$$\sum_{n=1}^{\infty} \frac{(x-7)^n}{3^n(2n+1)}$$

.

(a) Find the radius of convergence.

(b) Find the interval of convergence.

8. Let $a_n = n\left(\frac{x+3}{2}\right)^n$ and $b_n = \frac{1}{n^2+1}\left(\frac{x-1}{5}\right)^n$. Let $f(x) = \sum_{n=0}^{\infty} a_n$ and $g(x) = \sum_{n=0}^{\infty} b_n$.

(a) Find the IOC for f and g. Where do these converge absolutely?

(b) Carefully find the IOC for $h(x) = \sum_{n=0}^{\infty}(a_n + b_n)$.

9. Determine whether the series converges or diverges.

$$\sum_{n=2}^{\infty} \frac{1}{n \ln n}$$