



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

Math 231 – Calculus II

### Midterm 2 Worksheet

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*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.*

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

Session 1: March 9th, 7:00 - 8:50 pm (Hriday, Jaylin, Amy)

Session 2: March 29th, 6:00 - 7:50 pm (Tommy, Sushrut, and Yash)

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 integral converges or diverges. If so, what value does the integral converge to?

$$\int_5^{\infty} \frac{1}{n(\ln(n))^2}$$

2. Test the following improper integral for convergence. If it converges, find the value

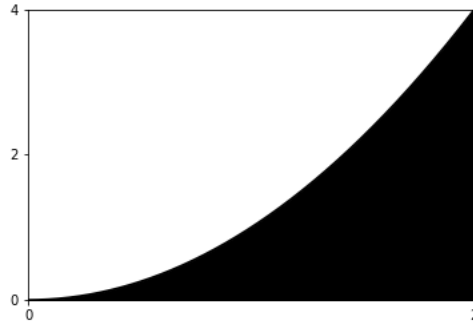
$$\int_0^{\infty} e^{-\frac{4}{3}y} dy$$

- (a) Diverges
- (b) Converges, value is  $-\frac{3}{4}$
- (c) Converges, value is  $\frac{4}{3}$
- (d) Converges, value is  $\frac{3}{4}$
- (e) None of the above

3. Determine if the following integral is convergent or divergent:

$$\int_2^{\infty} \frac{\cos^2 x}{x^2} dx$$

4. Find the  $M_x$ ,  $M_y$ , and the centroid of  $y = x^2$  with density  $\lambda$  on  $x \in [0, 2]$ .



5. The profile  $y = \sqrt{4 - x^2}$  on the interval  $x \in [-1, 1]$  is revolved around the  $x$ -axis. Find the surface area of this surface.
6. Compute the arc length of the function  $y = 1 + 2x^{\frac{3}{2}}$  between  $x = 0$  and  $x = 1$
- (a)  $\frac{14}{9}$
  - (b)  $\frac{10}{9}$
  - (c)  $\frac{2}{9}\sqrt{10}$
  - (d)  $\frac{2}{27}(10\sqrt{10} + 1)$
  - (e) None of the above

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

$$a_n = \frac{5n^2 + 2}{\sqrt{n^4 + 7n}}$$

- (a) 0
- (b) 5
- (c)  $\infty$
- (d)  $\frac{5}{\sqrt{7}}$
- (e) None of the above

8. Determine whether the geometric series is convergent or divergent. If it is convergent, find the sum. (If the quantity diverges, enter DIVERGES.)

$$\sum_{n=1}^{\infty} \frac{4(-3)^{n-1}}{7^n}$$

- (a)  $\frac{4}{7}$
- (b)  $\frac{2}{5}$
- (c)  $\frac{5}{2}$
- (d) DIVERGES
- (e) None of the above

9. Determine whether the series converges or diverges:

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

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

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

11. Determine whether the series converges or diverges.

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

12. Determine whether the series converges or diverges.

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

13. Determine whether the series converges or diverges.

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

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

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