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

Math 231 – Calculus II

Midterm 2 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: March 9th, 7:00 - 8:50 pm (Hriday, Jaylin, Amy)

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

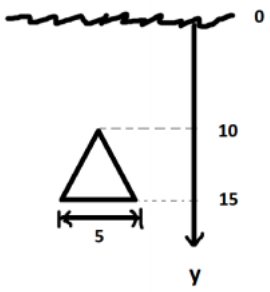
$$\int_0^\infty e^{-\frac{4}{3}y} dy$$

(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

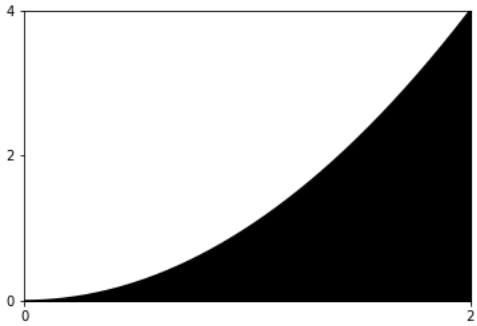
3. Determine if the following integral is convergent or divergent:

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

4. Determine the hydrostatic force on the triangle given the density of water $\rho = 1000\text{kg/m}^3$ with a depth y and $g = 9.8\text{m/s}^2$.



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



6. Consider the curve y = 5ln(x) between the points (1,0) and (e,5).

   A. SET UP, BUT DO NOT EVALUATE, a dx-integral which represents the arc length of the curve.

   B. SET UP, BUT DO NOT EVALUATE, a dy-integral which represents the arc length of the curve.

   C. SET UP, BUT DO NOT EVALUATE, a definite integral which represents the surface area of the surface obtained by rotating the curve around the line y =10.

7. 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.

8. 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

9. 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) ∞
(d) $\frac{5}{\sqrt{7}}$
(e) None of the above

10. 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