ILLINOIS

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

Math 220 – Calculus I

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: October 26, 5:40 - 6:50 pm Emma and Yaseen

Session 2: October 27, 6:00 - 7:20 pm Akshay and Sachika

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. Find $f'(x)$ given that $f(x) = \sqrt[4]{\arctan(x^9)}$

2. Suppose that A represents the number of grams of a radioactive substance at time t seconds. Given that $\frac{dA}{dt} = -0.125A$, how long does it take 12 grams of the substance to be reduced to 4 grams?

3. A streetlight is mounted at the top of a tall pole with $H = 16.5$ ft. Jennifer's height is $h = 5.5$ ft tall. She walks away from the pole with a speed of 8 ft/s along a straight path. how quickly is the length of her shadow on the ground increasing when she is 15 ft from the pole?

4. The top of a ladder slides down a vertical wall at a rate of 8 m/s. At the moment when the bottom of the ladder is 4 meters from the wall, it slides away from the wall at a rate of 15 m/s. How long is the ladder?

5. Find the absolute minimum y-value of the given function:

$$y = \frac{2x}{\sqrt{x - 81}}$$

6. Find $\frac{dy}{dx}$ given the following:

$$\sin\left(x^2 + y^3\right) = 5y + 8x$$

It is okay to leave your answer in terms of both x and y.

7. Evaluate the following derivatives:

(a) $\frac{d}{dx}\cos(x)$

(b) $\frac{d}{dx}\csc(x)$

(c) $\frac{d}{dx}\tan(x)$

(d) $\frac{d}{dx}\arcsin(x)$

(e) $\frac{d}{dx}\ln(x)$

8. A function $f(x)$ has the first derivative $f'(x) = e^{0.5x}(10x - 60)$

(a) Upon which interval is $f(x)$ increasing?

(b) Upon which interval is the graph of $f(x)$ concave down?

9. Evaluate each of the following limits:

(a)

$$\lim_{x\to\infty} \frac{2\ln(x)}{\sqrt[3]{x}}$$

(b)

$$\lim_{x \to 0} \frac{e^{10x} - 1}{5x}$$

(c)

$$\lim_{x \to \infty} \frac{e^{10x} - 1}{5x}$$