ILLINOIS

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

Math 231 — Engineering Calculus

Midterm 1 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: Sep. 21, 2:00pm-4:00pm Bella,

Session 2: Sep. 22, 1:00pm-3:00pm Grace, Sushrut

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

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. Which of the following are equivalent to the following?

$$\frac{1}{4+i}$$

(a) $4 - i$

(b) $i + 4$

(c) $\dfrac{4}{17} - \dfrac{i}{17}$

(d) $\dfrac{4}{\sqrt{17}} - \dfrac{i}{\sqrt{17}}$

2. What is the simplified form of the following?

$$\left(\frac{2+i}{1+4i}\right)^2$$

(a) $\dfrac{3}{8i - 15}$

(b) $\dfrac{24}{5} + \dfrac{7}{5}i$

(c) $-\dfrac{20}{46} - \dfrac{30}{46}i$

(d) $\dfrac{-13}{289} - \dfrac{84}{289}i$

3. Compute the Limit:

$$\lim_{x \to 0+} \frac{2}{x}$$

(a) $-\infty$

(b) 0

(c) does not exist

(d) ∞

4. Compute the Limit:

$$\lim_{x \to \infty} \frac{2x + \sin(x)}{x}$$

(a) 2

(b) $\frac{1}{4}$

(c) ∞

(d) 0

5. Compute the Limit:

$$\lim_{x \to \infty} \frac{\sin(5x)}{x}$$

(a) ∞

(b) 5

(c) does not exist

(d) 0

6. Compute the Limit:

$$\lim_{x \to \infty} \frac{9x^{6968} + 27x^{1789} + 88x^{900}}{45x^{6968} + 54x^{1789} + 264x^{900}}$$

(a) $\frac{1}{3}$

(b) $\frac{1}{2}$

(c) $\frac{1}{5}$

(d) ∞

7. Compute the Limit:

$$\lim_{x \to 3} \cos(3x)$$

(a) does not exist

(b) $\cos(3)$

(c) $\cos(9)$

(d) 1

8. If $f(y) = y \ln(y) - y$, compute $f'(1)$.

(a) 0

(b) ∞

(c) 1

(d) does not exist

9. Compute $f'(x)$ where $f(x) = x \cos(x^4)$

(a) $-4x^4 \sin(x^4)$

(b) $\sin(x^4) - 4x^4 \cos(x^4)$

(c) $\cos(x^4) - 4x^4 \sin(x^4)$

(d) $\cos(x^4)$

10. If $f(x) = \left((x^2 + 1)^3 + 4x\right)^2$, them find $f'(1)$.

(a) 144

(b) 672

(c) 512

(d) 48

11. If $3^x + 3^y = 3^{x+y}$ find $\dfrac{dy}{dx}$.

(a) 0

(b) 3^{x-y}

(c) $\dfrac{3^{x+y} - 3^x}{3^y - 3^{x+y}}$

(d) $\dfrac{3^x - 3^y}{3^{x+y}}$

12. A tank of water in the shape of a cone is being filled with water at a rate of 12m³/sec. The base radius of the tank is 26 meters and the height of the tank is 8 meters. At what rate is the depth of the water in the tank changing when the radius of the top of the water is 10 meters?

(a) $\dfrac{25\pi}{3}$

(b) $\dfrac{\pi}{3}$

(c) $\dfrac{25}{\pi}$

(d) $\dfrac{3}{25\pi}$

13. The Maclaurin series expansion of $e^{\sin x}$ is:

(a) $1 + x - \dfrac{x^2}{2} + \dfrac{x^4}{12} - \cdots$

(b) $1 - x + \dfrac{x^2}{2} - \dfrac{x^4}{8} + \cdots$

(c) $1 + x + \dfrac{x^2}{2} - \dfrac{x^4}{8} + \cdots$

(d) $1 + x + \dfrac{x^2}{2} - \dfrac{x^4}{12} + \cdots$