ARE YOU PREPARED?

✓ This mini quiz is meant to serve only as an indicator of a few of the math skills that you are expected to know at the beginning of this course. Do not use these problems as a study guide thinking that they will adequately prepare you for the course.

✓ These example problems are merely representative of some of the most important concepts that are taught in the prerequisite courses.

✓ The course will offer little or no time for any type of review; it assumes that you are prepared to do the work the first day of class.
Below are some of the major topics covered in MATH 252.

**Skills:**

1. Use of summation signs
2. Limit of summations as $n \to \infty$
3. Use of Reimann sums to find area
4. Interpret Reimann sum as definite integral
5. Fundamental Theorem of Calculus
6. Power rule for integration
7. Constant of integration
8. The Trapezoid rule
9. Simpson’s rule

**Applications:**

1. The area between two graphs using either $dx$ or $dy$
2. Volume using Disks and Washers, shells or slicing
3. Area of surface of revolution
4. Arc Length
5. Work required
6. Water pressure

To be successful studying the topics covered in this course, students should be appropriately prepared by: #1 Taking the prerequisite math course within the last three years with a passing grade of A or B, or within the last one year with a passing grade of C.
Below is a small sample of some technology free skills you should have BEFORE entering MATH 252

1. LIMITS:
   a) \( \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \) if \( f(x) = x^2 \)
   b) \( \lim_{x \to 2} \frac{x^2 - 4}{x - 2} \)
   c) \( \lim_{x \to 2} \frac{x - 1}{x - 2} \)
   d) \( \lim_{x \to \infty} \frac{\sqrt{x^2 + 2}}{3x - 6} \)
   e) \( \lim_{x \to 3} f(x) \) if \( f(x) = \begin{cases} \sqrt{x + 13}, & (-\infty, 3) \\ x^2 - 5, & [3, \infty) \end{cases} \)
   f) \( \lim_{\theta \to \pi} \csc(\theta) \)
   g) \( \lim_{t \to \infty} e^t \)
   h) \( \lim_{x \to 0^+} \ln(x) \)
   i) \( \lim_{y \to \infty} \tan^{-1}(y) \)

2. DERIVATIVES: Find \( \frac{dy}{dx} \)
   a) \( y = 4\sqrt{x} + \frac{1}{\sqrt{x}} \)
   b) \( y = \frac{(2x - 1)^6}{(3x + 4)^5} \)
   c) \( y = \ln(3x^2 + 2x) \)
   d) \( y = \cos(5x) - \sin^2(x) \)
   e) \( x^2 + 3xy - 5y^2 = 9 \)

3. A DISCONTINUITY exists for what values of \( x \)?
   a) \( \frac{3x + 1}{x^2 + 7x - 2} \)
   b) \( \cot(x) \)

4. GIVEN: \( f(x) = \frac{1}{12}x^4 + \frac{1}{6}x^3 - 3x^2 \)
   a) What are the CRITICAL VALUES?
   b) For what \( x \)-values is the curve CONCAVE down?

5. Find the local extrema of \( g(x) = \frac{1 - \ln(x)}{x^2} \)

6. For what \( x \)-values is there a local maximum or minimum of if \( y = \frac{x^2 - 1}{x^3} \)

7. What will be the RATE OF CHANGE in the area of a circle when the diameter is 20 feet if the radius is decreasing 1/10 foot per second?
ANSWERS

1. a) 2x  b) 4  c) ∞  d) $\frac{1}{3}$  e) 4
   f) ∞  g) 0  h) $-\infty$  i) $\frac{\pi}{2}$

2. a) $\frac{2}{\sqrt{x}} - \frac{1}{2x^2}$  b) $\frac{3(2x-1)^5 (2x+21)}{(3x+4)^6}$
   c) $\frac{6x+2}{3x^2 + 2x}$  d) $-5 \sin(5x) - 2 \sin(x) \cos(x)$
   e) $\frac{2x + 3y}{10y - 3x}$

3. a) $\frac{-7 \pm \sqrt{57}}{2}$  b) $k \pi$

4. a) $0, \frac{-3 \pm 3\sqrt{33}}{4}$  b) $-3 < x < 2$

5. $\left(e^{3/2}, -\frac{1}{2e^{3/2}}\right)$ is a local minimum point

6. A local maximum occurs at $x = \sqrt{3}$
   A local minimum occurs at $x = -\sqrt{3}$

7. $\frac{dA}{dt} = -2\pi \frac{ft^2}{sec}$

How many of these problems can you miss and still succeed in MATH 252?

Ideally, NONE.

These problems are just a sample of the larger number of skills that you should be familiar with BEFORE taking this course

If some of these ideas are not familiar to you, you should enroll in the prerequisite course (Math 251)