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 253.

1. Powerful integrating techniques including
   A. By parts
   B. Special Powers
   C. Trigonometric substitutions
   D. Quadratics
   E. Partial fractions
   F. Trapezoid rule
   G. Simpson’s rule

2. Improper Integrals
   A. How to deal with “holes”, vertical tangents and disjoint functions.

3. Limits of Indeterminate Forms
   A. L’Hopital
   B. Reciprocal rule
   C. Logarithmic Process

4. Sequences and series
   A. Limits
   B. Convergence and divergence
   C. Power series

5. Polar coordinates

6. Parametric equations

(Refer to problem 2 inside)

*2a) \( V = \pi \int_{0}^{8} \left( (\sqrt{2}y)^2 - \left[ \frac{y^2}{16} \right]^2 \right) dy = \)

*2b) \( V = \pi \int_{0}^{4} \left[ \left( 8 - \frac{x^2}{2} \right)^2 - (8 - 4\sqrt{x})^2 \right] dx = \)
Below is a sample of some skills you should have BEFORE entering MATH 253

Each problem should be solved without the use of a calculator!

1. Graph and find the area between the curves $y = 4\sqrt{x}$ and $2y = x^2$.

2. Simplify the expression $\frac{f(n+1)}{f(n)}$ for each function.
   
   a) $f(n) = \frac{3 \cdot 5^{2n+1}}{7^{n-2}}$
   b) $f(n) = \frac{n}{n+1}$

3. Evaluate each improper integral.
   
   a) $\int_{1}^{\infty} e^{-x} \, dx$
   b) $\int_{1}^{\infty} \frac{2t}{1+t^2} \, dt$

4. Evaluate each limit; use L'Hopital's Rule where appropriate.
   
   a) $\lim_{x \to \infty} \frac{\sin(x)}{x}$
   b) $\lim_{t \to \infty} (t e^{-t^2})$
   c) $\lim_{\theta \to \infty} \left(3\theta \tan\left(\frac{5}{\theta}\right)\right)$

5. Find the velocity, speed and acceleration at $t = 1$ if $s = 2t^3 - 5t$

6. Determine the interval(s) over which the function $g(t) = \frac{t^3}{3} - \frac{5}{2}t^2 - 14t + 8$ is decreasing.

7. Integrate: a) $\int \frac{1}{\sqrt{x}} \cos\sqrt{x} \, dx$
   b) $\int \sqrt{\tan x} \sec^2 x \, dx$
   c) $\int e^{3\ln(x)} \, dx$

8. Find: $\sum_{k=1}^{10} k$

9. Which of the following expressions is equal to the length of side c in the triangle shown in Figure 1?
   
   a) $a \tan(\phi)$
   b) $b \cos(\phi)$
   c) $a \cos(\phi)$
   d) $b \sin(\phi)$
   e) none of these
Answers

1. \( \frac{32}{3} \)
2. a. \( \frac{25}{7} \) b. \( \frac{(x + 1)^2}{x(x + 2)} = \frac{x^2 + 2x + 1}{x^2 + 2x} \)
3. a. \( \frac{1}{e} \) b. \( \frac{\pi}{2} \)
4. a. 0 b. 0 c. 15

5. The speed and velocity are both 1 and the acceleration is 12

6. \((-2, 7)\)

7. a. \(2\sin \sqrt{x} + C\) b. \(\frac{2}{3}\tan^{3/2}(x) + C\) c. \(\frac{x^4}{4} + C\)

8. 55
9. e

How many of these problems can you miss and still succeed in MTH 253?

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 one of the prerequisite courses.