This review, produced by the Broward Teaching Center, contains a collection of questions which are representative of the type you may encounter on the exam. Other resources made available by the Teaching Center include:

- Walk-In tutoring at Broward Hall
- Private-Appointment, one-on-one tutoring at Broward Hall
- Walk-In tutoring in LIT 215
- Supplemental Instruction
- Video resources for Math and Science classes at UF
- Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
1. Investigate the convergence of the series \( \sum_{n=1}^{\infty} \left( \frac{2n+3}{3n+2} \right)^n \).

2. Suppose that \( \sum_{n=0}^{\infty} c_n (x + 1)^n \) converges for \( x = 1/2 \) and diverges for \( x = -4 \). Consider:

\[
A = \sum_{n=0}^{\infty} c_n (-5)^n \quad B = \sum_{n=0}^{\infty} c_n \quad C = \sum_{n=0}^{\infty} c_n 2^n
\]

What can be said about the convergence of series \( A, B, \) and \( C \)?

3. Investigate the convergence of \( \sum_{n=1}^{\infty} \frac{\cos(n\pi)}{4n} \).

4. Use the fact that \( 4 \arctan(1) = \pi \), and \( \frac{1}{1 + x^2} = \sum_{n=0}^{\infty} (-1)^n x^{2n} \) to find a series representation for the number \( \pi \). [Hint: integrate]

5. Express \( \int_0^x \frac{e^t - 1 - t}{t^2} \, dt \) as a power series. Find the IOC.

6. Evaluate \( \int \frac{1}{\sqrt{3-2x-x^2}} \, dx \).

7. Find the sum of the series \( S = \sqrt{2} - \frac{\sqrt{2}\pi^2}{4^2 \cdot 2!} + \frac{\sqrt{2}\pi^4}{4^4 \cdot 4!} - \frac{\sqrt{2}\pi^6}{4^6 \cdot 6!} + \cdots \)

8. Evaluate the definite integral \( \int_0^1 \sqrt{4-x^2} \, dx \).

9. Set up the partial fraction decomposition for \( \frac{1}{x^4 - 9x^2} \).
10. Complete the partial fraction decomposition from the previous problem and use it to evaluate
\[\int \frac{1}{x^4 - 9x^2} \, dx.\]

11. Evaluate \[\int x^2 \sqrt{x^2 - 4} \, dx\]

12. Which of the following integrals converge?

   I. \(\int_2^\infty \frac{1}{x^{\pi/3}} \, dx\)
   II. \(\int_1^\infty \frac{e^t}{1 + e^{4t}} \, dt\)
   III. \(\int_2^\infty \frac{1}{\ln(s)} \, ds\)

13. Find a closed form for the \(N^{th}\) partial sum of \(\sum_{n=2}^\infty \ln \left( \frac{n}{n+1} \right)\)

14. Sketch the polar curve \(r = 1 + \cos(\theta)\), and set up an integral to find the area above the horizontal axis.

15. Given \(r = 1 - 2 \cos(\theta)\) set up an integral for the area of the inner loop.

16. Set up an integral for the area inside \(r_2\) and outside \(r_1\) where \(r_1 = \sqrt{3} \sin(\theta)\) and \(r_2 = \cos(\theta)\).

17. Given \(x(t) = e^t + 5t\) and \(y(t) = 100\), find the arclength from \(t = 0\) to \(t = 5\).

18. At what points (if any) does the parametric curve have horizontal or vertical tangent lines?
   \[x(t) = \cos^2(t) + \cos(t)\]
   \[y(t) = \sin(t) \cos(t) + \sin(t)\]

19. Consider the solid obtained by rotating the region bounded by \(y = \ln(x), \ x = e,\) and \(y = 0\) about the \(x\)-axis. Set up two integrals for the volume of this solid. One using the disk/washer method, the other using cylindrical shells.