These are only a few sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the assigned homework, in-class work, and your class notes.

1. Is it possible that the terms of a series converge but the partial sums diverge? Can the partial sums converge but the terms diverge? Explain.

2. Do the following series diverge, converge conditionally, or converge absolutely?

$$\text{(a)} \sum_{n=1}^{\infty}(-1)^n \frac{n}{\pi n - 1} \qquad \text{(b)} \sum_{r=10}^{\infty} \frac{(-1)^r}{r-6} \qquad \text{(c)} \sum_{k=1}^{\infty}(-1)^k \frac{2k}{k^3+2}$$

3. Find the interval of convergence for the power series

$$\text{(a)} \sum_{k=0}^{\infty} 3^k x^k \qquad \text{(b)} \sum_{k=1}^{\infty} \frac{(x-4)^k}{k2^k}$$

4. Let $a(x)$ be a continuous function that is positive and decreasing for all $x \geq 1$. Let $a_k = a(k)$. Rank the following values. Draw diagrams to explain your answer.

$$A = \sum_{k=5}^{n-1} a_k \qquad B = \sum_{k=6}^{n} a_k \qquad C = a_5 + \int_6^n a(x)\,dx \qquad D = \int_5^n a(x)\,dx$$

5. Show that the following series converge and find a value N where S_N approximates the value of the series accurate within 0.001.

$$\text{(a)} \sum_{k=6}^{\infty}(-1)^k \frac{17}{k! + k^2} \qquad \text{(b)} \sum_{k=1}^{\infty} 2k^2 e^{-k^2}$$

6. Calculate $\displaystyle\int_0^1 \cos(x^2)\,dx$ accurate within 0.001 *by hand without the use of a calculator.*

7. Give examples that demonstrate why the Ratio Test is inconclusive when $\displaystyle\lim_{k\to\infty} \frac{a_{k+1}}{a_k} = 1$.

   That is, give an example of a convergent series with this property and another example of a divergent series with this property.

8. Approximate $\sqrt[3]{e}$ accurate within 0.001 by hand. *Hint:* $\sqrt[3]{e} = e^{\frac{1}{3}}$