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?

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

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

3. (a) Show that $\displaystyle\sum_{j=17}^{\infty}\left(\frac{e}{\pi}\right)^j$ converges and find the ***exact*** value of the series (i.e. no decimal approximations).

   (b) Evaluate $\displaystyle\sum_{k=1}^{326}\left(\frac{3}{7}\right)^k$ by hand.

4. Find the interval of convergence for the power series

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

5. 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.

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

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

   (a) $\displaystyle\sum_{k=6}^{\infty}(-1)^k \frac{17}{k! + k^2}$ (b) $\displaystyle\sum_{k=3}^{\infty}\frac{\sin(k)+2}{k^5+\ln(k)}$ (c) $\displaystyle\sum_{k=1}^{\infty}2k^2 e^{-k^2}$

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.