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

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

2. Do the following series diverge, converge conditionally, or converge absolutely? Be sure to justify your answer by giving reference to the appropriate theorems and/or tests.

$$(a)\ \sum_{k=3}^{\infty}(-1)^{k+1}\frac{\sqrt{k+1}}{\ln(k)} \qquad (c)\ \sum_{j=0}^{\infty}\cos(j)\,j^5\,e^{-j^3}$$

$$(b)\ \sum_{k=3}^{\infty}\frac{2k}{4k^8+7k^2+6} \qquad (d)\ \sum_{k=10}^{\infty}(-1)^k\frac{3}{4k+2}$$

   Pick one of the series that converges. How close does S_{75} approximate the value of the series?

3. Let $\mathcal{I} = \displaystyle\int_0^1 \cos(x^2)\,dx$.
   (a) Calculate $\mathcal{I}$ accurate within 0.001 by hand with the use of only a four function $(+, -, \times, \div)$ calculator.
   (b) Find a value of n such that T_n approximates $\mathcal{I}$ accurate within 0.001.
   It may be useful to know that the absolute value of the second derivative of $\cos(x^2)$ is less than 4 on the interval $[0, 1]$.

4. Find the *exact* value of the following by hand (no decimal approximations!)

$$(a)\ \sum_{k=42}^{\infty}\frac{1}{4^k} \qquad (c)\ \sum_{k=0}^{\infty}\frac{1}{3^k\,k!}$$

$$(b)\ \sum_{k=0}^{326}\left(\frac{3}{7}\right)^k \qquad (d)\ \sum_{k=0}^{\infty}(-1)^k\frac{\left(1/\sqrt{3}\right)^{2k+1}}{2k+1}$$

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

$$A = \sum_{k=5}^{\infty} a_k \qquad B = \sum_{k=6}^{\infty} a_k \qquad C = \int_5^{\infty} a(x)\,dx$$

   (b) Explain how your answer is related to the Integral Test for series.