These are only a <u>few</u> 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. Determine if the following sequences converge or diverge. If the sequence converges, find the limit.

   (a) $\left\{\dfrac{\sqrt{k+1}}{\ln(k)}\right\}_{k=2}^{\infty}$

   (b) $\{a_k\}_{k=1}^{\infty}$ where $a_k = \displaystyle\int_1^k \frac{1}{1+x^2}\,dx$

2. (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.

3. Show that the following series converge.
   How accurately does S_{75} approximate the exact value of the series?

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

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

   (a) $\displaystyle\sum_{n=1}^{\infty}\frac{n}{\pi n+1}$ (b) $\displaystyle\sum_{k=10}^{\infty}\frac{3}{4k-2}$ (c) $\displaystyle\sum_{k=3}^{\infty}\frac{2k}{4k^8+7k^2+6}$

5. Let $\mathcal{I} = \displaystyle\int_0^1 \cos(x^2)\,dx$.

   (a) Calculate $\mathcal{I}$ accurate within 0.001 by hand without the use of a calculator.

   (b) Find a value of n such that M_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 $[0,1]$.

6. Find the exact value of the following by hand

   (a) $\displaystyle\sum_{k=42}^{\infty}\frac{1}{4^k}$ (b) $\displaystyle\sum_{k=0}^{326}\left(\frac{3}{7}\right)^k$ (c) $\displaystyle\sum_{k=0}^{\infty}\frac{1}{3^k\,k!}$ (d) $\displaystyle\sum_{k=0}^{\infty}(-1)^k\frac{\left(\sqrt{3}\right)^{2k+1}}{2k+1}$