Test 3 - Calculus II (Spring 2016)

INSTRUCTIONS: Complete each of the following problems in your Bluebook. Each problem is worth a maximum of 12 points. Points will be awarded for both completeness and clarity of solutions. Partial credit will be awarded for partial solutions. Please recall that **cell phones and graphing calculators are not allowed on this exam.**

1. Determine the convergence or divergence of the following series. Carefully justify your answers.

(a) $\displaystyle\sum_{n=1}^{\infty}(-1)^n\frac{\sqrt{n}}{(\ln n)^2}$ (b) $\displaystyle\sum_{n=1}^{\infty}\frac{n^{10}\cdot 10^n}{n!}$

2. Determine the convergence or divergence of $\displaystyle\sum_{k=1}^{\infty}\left(\frac{4k^6}{10k^6+5k^5}\right)^k$. Carefully justify your answers.

3. Compute the value of $\displaystyle\sum_{n=0}^{\infty}\frac{24+2^n}{3^n}$, or show that the series diverges.

4. Determine whether the series $\displaystyle\sum_{k=1}^{\infty}(-1)^{k+1}\cdot\left(\frac{k^{101/100}}{k^2+2k+1}\right)$ converges absolutely, converges conditionally, or diverges. Carefully justify your answer.

5. Use the integral test to determine whether $\displaystyle\sum_{k=2}^{\infty}\frac{1}{k(\ln k)^2}$ converges or diverges. (*Hint:* Use substitution rule.)

BONUS. (+6 points) Determine whether $\displaystyle\sum_{n=1}^{\infty}\frac{n^{n-1}}{e^n\cdot n!}$ converges or diverges.

(*Hint:* Use *Stirling's approximation*, which says that the sequences $(n!)$ and $\left(\dfrac{n^n\sqrt{2\pi n}}{e^n}\right)$ have the same growth rate, to find a nice series with which to compare.)