Calculus II ESP | # Exam 2 Review | **Spring 2013**

Worksheet # 21

1. Determine whether the following integrals converge, and if so, evaluate.

   (a) $\int_1^\infty x^2 e^{-x}\, dx$

   (b) $\int_0^1 \frac{x}{x-1}\, dx$

2. Compute the volume of the solid generated by revolving the region under the graph of $y = 1/x^2$, $1 \le x \le \infty$ about the x axis.

3. Find the values of the series.

   (a) $\sum_{k=0}^{\infty} (\frac{2}{3})^k$

   (b) $\sum_{k=0}^{\infty} \frac{4^{k-2}+1}{5^k}$

   (c) $\sum_{k=1}^{\infty} \frac{-1}{k^2+k}$

4. Show the convergence or divergence of each series.

   (a) $\sum_{k=1}^{\infty} \frac{1}{k^{3/2}+1}$

   (b) $\sum_{k=1}^{\infty} \frac{k^2}{2^k}$

5. Use the trapezoid rule with four subintervals to approximate $\int_0^\pi \cos\theta\, d\theta$.

6. Suppose that for an infinite series $\sum_{k=1}^{\infty} a_k$, the n^{th} partial sum is given by $S_n = 1 - \frac{1}{n}$.

   (a) What is $\lim_{n\to\infty} S_n$?

   (b) Does $\sum_{k=1}^{\infty} a_k$ converge or diverge? Explain your answer.

7. Use the precise definition of the limit to prove that $\lim_{n\to\infty} \frac{1}{\sqrt{n}} = 0$