SEQUENCES AND SERIES
WORKSHEET 1

Do these problems on notebook paper. You may use your graphing calculator on problem 4 only,

1. Determine if the sequence $\left\{\dfrac{\ln x}{x^2}\right\}$ converges.

2. Find the nth term (rule of sequence) of each sequence, and use it to determine whether or not the sequence converges.

(a) $2, \dfrac{3}{4}, \dfrac{4}{9}, \dfrac{5}{16}, \dfrac{6}{25}, \ldots$

(b) $1, \dfrac{1}{2}, \dfrac{1}{6}, \dfrac{1}{24}, \dfrac{1}{120}, \ldots$

3. Use the nth Term Divergence Test to determine whether or not the following *series* converge:

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{1+3n^2+n^3}{4n^3-5n+2}$

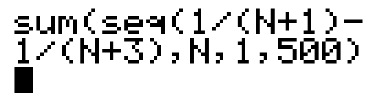
(b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{2n!+1}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{(n+2)!}{10n!}$

4. (a) What is the sum of $\displaystyle\sum_{n=1}^{\infty}\left(\frac{1}{n+1}-\frac{1}{n+3}\right)$

(b) Using your calculator, calculate S_{500} to verify that the SOPS (sum of the partial sums) is bounded by the sum you found in part (a).



5. Use the indicated test for convergence to determine if the series converges or diverges. If possible, state the value to which it converges.

(a) Geometric Series: $3+\dfrac{15}{4}+\dfrac{75}{16}+\dfrac{375}{64}+\cdots$

(b) Geometric Series: $\dfrac{1}{2}+\dfrac{1}{4}+\dfrac{1}{8}+\dfrac{1}{16}+\dfrac{1}{32}+\dfrac{1}{64}+$

(c) p-series: $\displaystyle\sum_{n=1}^{\infty} n^{-2/3}$

(d) Integral Test: $\displaystyle\sum_{n=1}^{\infty} \frac{3n}{2n^2+3}$

(e) Direct Comparison: $\displaystyle\sum_{n=1}^{\infty} \frac{e^n}{n+3}$

(f) Direct Comparison: $\displaystyle\sum_{n=1}^{\infty} \frac{3^n}{7^n+1}$

(g) Limit Comparison: $\displaystyle\sum_{n=1}^{\infty} \frac{3n+6}{1-5n+7n^2}$

(h) Limit Comparison: $\displaystyle\sum_{n=1}^{\infty} \frac{n+5}{3n\left(4^n\right)}$

(i) Ratio Test: $\displaystyle\sum_{n=1}^{\infty} \frac{n^3}{n!}$

(j) Ratio Test: $\displaystyle\sum_{n=1}^{\infty} \frac{2}{n^2}$

(k) AST: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$

(l) AST: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n(n+3)}{2n}$

(m) Direct Comparison: $\displaystyle\sum_{n=1}^{\infty} \frac{\sin n}{n^2}$

(n) Any method: $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n\left(4^n\right)}{n!}$

6. Find the interval in which the actual sum of $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ is contained if S_5 is used to approximate it.