Chapter 9 - Review Problems

Name: _____

For each of the following problems, write up a complete and readable solution on your own paper. Make sure your name is clearly visible and all of the pages are stapled. Do not use a completely dull pencil, turn in your stream-of-consciousness scratch work, or write your final answers on the back of a postcard.

1. Classify each of the following series as divergent, conditionally convergent, or absolutely convergent. Remember that absolute convergence implies convergence, this fact can often save you work whether the series converges or diverges. Show work that proves your answer is correct.
   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{\ln(n)}$
   (b) $\displaystyle\sum_{n=1}^{\infty} \ln\left(\sqrt{\frac{n+2}{n}}\right)$
   (c) $\displaystyle\sum_{n=0}^{\infty} \frac{\sin(\pi n)}{n^2}$
2. Decide if each of the series converges. You can use any method unless the problem specifies otherwise.
   (a) $\displaystyle\sum_{n=0}^{\infty} \frac{\sin(n)}{(n+1)\ln(n+2)}$
   (b) $\displaystyle\sum_{k=30}^{\infty} \frac{k}{\ln(k)^2}$

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{n^4}{n^2 - 6n + 2 - n!}$

(d) $\displaystyle\sum_{n=3}^{\infty} \frac{(-1)^n}{\ln(\ln(n))}$

(e) $\displaystyle\sum_{m=0}^{\infty} \frac{1}{\sqrt{m+1}(\sqrt{m+2})}$

(f) *Tricky:* $\displaystyle\sum_{n=0}^{\infty} \frac{(2n)! + n^2}{(2n+1)! - n}$

(g) *Tricky:* $\displaystyle\sum_{n=0}^{\infty} \frac{\sin(2n)}{\cos(2n) - 3}$

(h) *Very Tricky:*[1] $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{n^n}$

3. Find the interval of convergence of the following power series. Make sure to check the endpoints.

(a) $\displaystyle\sum_{n=0}^{\infty} 3^{-n}(x-1)^n$

(b) $\displaystyle\sum_{n=0}^{\infty} \frac{(x+1)^n}{n}$

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{\sqrt{(n!)}x^n}{2^n}$

(d) $\displaystyle\sum_{n=0}^{\infty} 10^n x^{2n+1}$

[1] This problem is optional, you do not need to know how to solve this for our course.