WORKSHEET 12

1. State the **Alternating Series Test**. Give an example of an alternating series which does not converge.

2. Determine whether the following series converge or diverge:

   a) $\displaystyle\sum_{n=2}^{\infty} \frac{\cos(n\pi)}{\ln n}$ b) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{3+(-1)^n}{2n}$ c) $\displaystyle\sum_{n=2}^{\infty} (-1)^n \frac{\ln n}{n+1}$

3. Find an approximation to the value of

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n}$$

   with an error less than .1. Is your approximation too large or too small?

4. a) Use the first eight terms of the following series to estimate its actual value:

$$\sum_{n=0}^{\infty} (-1)^n \frac{1}{2^n}.$$

   b) What can be said about the size of the error of your approximation in part a)?

   c) Find the **exact** value of this series. How far off was your estimate?

5. Does $\sum a_n$ converge if

   a) $a_n = \begin{cases} 1/3^n, & \text{if } n \text{ is odd} \\ -n/3^n, & \text{if } n \text{ is even} \end{cases}$ b) $a_n = \dfrac{n!}{n^n}$ c) $a_1 = 10, \quad a_{n+1} = \dfrac{a_n}{n}$

6. Two market women were selling apples, one at 3 apples for a penny and the other at 2 apples for a penny. One day when both were called away they left their stock in charge of a friend. To simplify her reckoning the friend amalgamted the stocks - there were 30 apples of each quality - and sold them all at 5 for two pennies. Thus the friend took in 24 pennies. When it came to dividing the proceeds between the two owners, trouble arose. The one who had turned over 30 apples of 3 for a penny quality demanded her due 10 pennies. The other not unreasonably asked for 15 pennies. The sum actually realized was a penny short. Where did it (the missing penny) go?

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