Problem Set # 8

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10/05/2020

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1.a $\sum_{k=1}^{\infty} \frac{(-1)^k}{k \ln(k)}$

$$\lim_{k\to\infty} \frac{1}{k \ln(k)} = 0$$

$$S_n < S_{n+1} \therefore \ Converges$$

$$\frac{1}{kln(k)} < \frac{1}{k}$$

$$\frac{k}{1} * \frac{1}{kln(k)} = \frac{1}{\ln(k)}$$

$\lim_{k\to\infty} \frac{1}{ln(k)} = 0 \therefore$ Divergent because of LCT

Converges Conditionally

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

$$\frac{-4}{5} * \frac{1}{1 + \frac{4}{5}}$$

$$\frac{4}{5 + 4}$$

$$\frac{4}{9}$$

Converges Absolutely

1.c $\sum_{k=1}^{\infty} \frac{(-4)^k}{k^2}$

$\lim_{k\to\infty} \frac{(-4)^k}{k^2} \neq 0 \therefore Divergent$

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

$\lim_{k\to\infty} \frac{2+1}{k^2}$

$\frac{3}{k^2}$ $2 > 1 \therefore$ Convergent because of p-series