Completion points = 10
Selected problem points = 10

Homework 3 MATH 1930

10.2 29 $\sum_{n=0}^{\infty} \frac{1}{n+4}$

$\lim_{n\to\infty} \frac{1}{n+4} = 0 \Rightarrow$ Test inconclusive.

10.3 29 $\sum_{n=1}^{\infty} \frac{1}{(\ln 2)^n} = \frac{1}{\ln 2} + \frac{1}{(\ln 2)^2} + \frac{1}{(\ln 2)^3} + \cdots$

$r = \frac{1}{\ln 2} \approx 1.44 > 1$ hence $\boxed{\text{diverges}}$

10.4 25 $\sum_{n=1}^{\infty} \left(\frac{n}{3n+1}\right)^n$

$\frac{n}{3n+1} < \frac{n}{3n} = \frac{1}{3}$

$\left(\frac{n}{3n+1}\right)^n < \left(\frac{1}{3}\right)^n$

Geometric series with $r = \frac{1}{3} < 1$ hence converges.

$\therefore \sum_{n=1}^{\infty} \left(\frac{n}{3n+1}\right)^n$ converges by the Direct Comparison Test.

10.5 21 Ratio Test $a_n = \frac{n^{10}}{10^n}$ $a_{n+1} = \frac{(n+1)^{10}}{10^{n+1}}$

$\frac{a_{n+1}}{a_n} = \frac{(n+1)^{10} \cdot 10^n}{10^{n+1} \cdot n^{10}} = \left(1 + \frac{1}{n}\right)^{10} \cdot \frac{1}{10}$

$\lim_{n\to\infty} \frac{a_{n+1}}{a_n} = \lim_{n\to\infty} \left(1+\frac{1}{n}\right)^{10} \cdot \frac{1}{10} = \frac{1}{10} < 1$

$\therefore$ $\boxed{\text{Converges}}$

10.6 16 $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(0.1)^n}{n}$

$$|a_n| = \left|(-1)^{n+1} \frac{(0.1)^n}{n}\right| = \frac{(0.1)^n}{n} = \frac{1}{10^n n} < \left(\frac{1}{10}\right)^n$$

Geometric Series with $r = \frac{1}{10} < 1$

$\therefore \sum_{n=1}^{\infty} \left|(-1)^{n+1} \frac{(0.1)^n}{n}\right|$ converges.

hence $\boxed{\text{converges absolutely}}$.