Name: Section: 5 6 9 10

Pick TWO of the following three series and determine if they converge absolutely, converge conditionally, or diverge. Clearly state which tests you are using and justify your work.

$$(a)\ \sum_{n=1}^{\infty} \frac{n}{n+2} \qquad (b)\ \sum_{n=1}^{\infty} \frac{e^n}{n!} \qquad (c)\ \sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}$$

(a) Divergence test: $\lim_{n\to\infty} \frac{n}{n+2} = \frac{1}{1} = 1 \neq 0$

series diverges

(b) ~~Series / is~~ Try Ratio test:

$$\left|\frac{a_{n+1}}{a_n}\right| = \left|\frac{e^{n+1}}{(n+1)!} \cdot \frac{n!}{e^n}\right| = \frac{e}{n+1} \to 0 < 1$$

Series converges absolutely.

(c) $\sum_{n=1}^{\infty} \left|\frac{(-1)^n}{n+1}\right| = \sum_{n=1}^{\infty} \frac{1}{n+1}$ comparison test:

$\frac{1}{n+1} \geq \frac{1}{n+n} = \frac{1}{2} \cdot \frac{1}{n}$. Since $\sum_{n=1}^{\infty} \frac{1}{2}\cdot\frac{1}{n}$ diverges

(p-series $p=1$), then $\sum_{n=1}^{\infty} \frac{1}{n+1}$ doesn't converge..

Next, try AST: $b_n = \frac{1}{n+1}$

yes, b_n's are positive & decreasing, and

$\lim_{n\to\infty} b_n = \lim_{n\to\infty} \frac{1}{n+1} = 0$

$\therefore$ series converges conditionally.