BC Calc 9.4 Pg 511 # 29, 30, 32, 33, 34, 38, 39

(29) $\sum_{n=1}^{\infty} \frac{n}{n+1}$; $\lim_{n\to\infty} \frac{n}{n+1} = 1$ which $\neq 0$ diverges by n^{th} term test

(30) $\sum_{n=1}^{\infty} \frac{|2^n}{n+1}$; $\lim_{n\to\infty} \frac{|2^n}{n+1} = \infty \neq 0$ diverges by n^{th} term test.

(32) $\sum_{n=1}^{\infty} -\frac{1}{e^n}$, Geometric w/ $|r| = |-\frac{1}{e}| < 1$. Converges

or $\lim_{n\to\infty} -\frac{1}{e^n} = 0$ Converges by n^{th} term test

(33) $\sum_{n=1}^{\infty} \frac{2^n}{3^n+1}$; $\frac{|2^n}{3^n+1} < \left(\frac{2}{3}\right)^n$. $\sum_{n=1}^{\infty} \left(\frac{2}{3}\right)^n$ converges

(Geometric with $|r|<1$) $\sum_{n=1}^{\infty} \frac{|2^n}{3^n+1}$ also converges by Direct Comparison Test.

(34) $\sum_{n=1}^{\infty} n \cdot \sin\left(\frac{1}{n}\right)$; $\lim_{n\to\infty} n \cdot \sin\left(\frac{1}{n}\right) \Rightarrow \lim_{c\to 0} \frac{1}{c} \cdot \sin(c)$

Let $c = \frac{1}{n}$, $n = \frac{1}{c}$ $= \lim_{c\to 0} \frac{\sin c}{c} = 1$

$\sum_{n=1}^{\infty} n \cdot \sin\left(\frac{1}{n}\right) = 1 \neq 0$

$\therefore$ Diverges by n^{th} term test.

(38) $\sum_{n=1}^{\infty} \left(1 + \frac{1}{n}\right)^n$, $\lim_{n\to\infty} \left(1+\frac{1}{n}\right)^n = e \neq 0$

Diverges by nth term test

(39) $\sum_{n=0}^{\infty} \frac{(-2)^n}{3^n} = \sum_{n=0}^{\infty} \left(\frac{-2}{3}\right)^n$ geometric series

with $|r| < 1$, converges.