Quiz 15

1 (a) $\lim_{n\to\infty} \frac{n+2}{8n+5000} \overset{LH}{=} \lim_{n\to\infty} \frac{1}{8} = \frac{1}{8} \neq 0,$

$\therefore$ series diverges by nth term test

(b) Geometric, $a = 8, r = 2/3 < 1$

$\therefore$ converges to $\frac{a}{1-r} = \frac{8}{1-2/3} = 24$

2 (a) $s_1 = \frac{9}{10}, s_2 = \frac{9}{10} + \frac{9}{40} = \frac{45}{40} = \frac{9}{8}$

$s_3 = \frac{9}{10} + \frac{9}{40} + \frac{9}{88} = \frac{9}{8} + \frac{9}{88} = \frac{99}{88} + \frac{9}{8} = \frac{108}{88} = \frac{27}{22}$

(b) $s_n = s_1 + s_2 + \cdots + s_n =$

$\left(\frac{3}{2} - \frac{3}{5}\right) + \left(\frac{3}{5} - \frac{3}{8}\right) + \left(\frac{3}{8} - \frac{3}{11}\right) + \cdots + \left(\frac{3}{3n-1} - \frac{3}{3n+2}\right)$

$= \frac{3}{2} - \frac{3}{3n+2}$

$\therefore$ series converges to

$\lim_{n\to\infty} s_n = \lim_{n\to\infty} \frac{3}{2} - \frac{3}{3n+2} = 3/2$