4. (a) For each of the following sequences find the limit of the sequence, if it exists, as $n \to \infty$.

i.
$$s_n = \frac{3n^2 + 2n + 4}{5n^2 - 8n + 1}$$
[2]

ii.
$$a_n = \frac{1}{n}(n + (-1)^n)$$
[2]

(b) Give the definition for what it means for an infinite series of terms
$$\sum_{n=0}^{\infty} a_n = a_0 + a_1 + a_2 + \cdots + a_n + \cdots$$
to have a *sum* or, equivalently, that it *converges*. [2]

(c) Does the following infinite series converge or diverge? Prove your answer.
$$\sum_{n=1}^{\infty} \frac{n}{2n^2 - 1}$$
[4]