1. Find the limits of the following sequences. You may use the common limits from class if relevant.

(a) \( \lim_{n \to \infty} \frac{(-1)^n}{n^2} = 0 \) by Sandwich Theorem

(b) \( \lim_{n \to \infty} \frac{n}{3n+1} = \lim_{n \to \infty} \frac{1}{3} = \frac{1}{3} \)

2. Which of the following infinite series converge? For the convergent series, find their sum.

(a) \( \sum_{n=1}^{\infty} \frac{(-1)^n}{3^n} = \sum_{n=1}^{\infty} \left( -\frac{1}{3} \right)^n \), geometric ratio = \( \frac{-1}{3} \), \( |\text{ratio}| < 1 \),

\( \frac{\text{first term}}{1 - \text{ratio}} = \frac{-\frac{1}{3}}{1 - \left(-\frac{1}{3}\right)} = \frac{-\frac{1}{3}}{\frac{4}{3}} = \frac{-1}{4} \) converges

(b) \( \sum_{n=2}^{\infty} \left( \frac{1}{\sqrt{n}} - \frac{1}{\sqrt{n+1}} \right) \) Telescopic with \( g(n) = \frac{1}{\sqrt{n}} \)

\( \lim_{n \to \infty} (g(2) - g(n)) = \lim_{n \to \infty} \left( \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{n}} \right) \)

\( = \frac{1}{\sqrt{2}} - 0 = \frac{1}{\sqrt{2}} \)