

## Problem 7)

$$\begin{aligned}
\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{(n+1)^2} &= \sum_{n=1}^{\infty} (-1)^{n+1} \frac{n+1-1}{(n+1)^2} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n+1} - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(n+1)^2} \\
&= \sum_{n=2}^{\infty} \frac{(-1)^n}{n} - \sum_{n=2}^{\infty} \frac{(-1)^n}{n^2} = \left(1 - 1 - \sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n}\right) - \left(1 - 1 - \sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n^2}\right) \\
&= \left(1 - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}\right) - \left(1 - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}\right) \\
&= (1 - \ln 2) - \left(1 - \frac{\pi^2}{12}\right) \\
&= \frac{\pi^2}{12} - \ln 2.
\end{aligned}$$