Problem 1)

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{(n+1)^2} = \sum_{n=1}^{\infty} (-1)^{n+1} \frac{n+1-1}{(n+1)^2} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n+1} - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(n+1)^2}$$

$$= \sum_{n=2}^{\infty} \frac{(-1)^n}{n} - \sum_{n=2}^{\infty} \frac{(-1)^n}{n^2} = \left(1 - 1 - \sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n}\right) - \left(1 - 1 - \sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n^2}\right)$$

$$= \left(1 - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}\right) - \left(1 - \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}\right)$$

$$= (1 - \ln 2) - \left(1 - \frac{\pi^2}{12}\right)$$

$$= \frac{\pi^2}{12} - \ln 2 .$$