

Prove that

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^2} = \frac{1}{1^2 \cdot 2^2} (1+2) + \frac{1}{3^2 \cdot 4^2} (3+4) + \frac{1}{5^2 \cdot 6^2} (5+6) + \dots$$