Quiz # 10
Math 102-Section **10** Calculus II
25 April 2019, Thursday
Instructor: Ali Sinan Sertöz
**Solution Key**

Bilkent University

**Q-1)**

(i) Does the series $\displaystyle\sum_{n=0}^{\infty} \frac{20n^2 + 19n}{(n + 2019)(n + 2020)}$ converge or diverge? Why?

(ii) Does the series $\displaystyle\sum_{n=2}^{\infty} \frac{2019}{n(\ln n)^2}$ converge or diverge? Why?

(iii) Find the sum of the series $\displaystyle\sum_{n=0}^{\infty} \frac{1}{(n + 2019)(n + 2020)}$.

Grading: (i) 3 points, (ii) 3 points, (iii) 4 points.

**Solution:**

**(i)** The general term does not go to zero as $n$ goes to infinity. Therefore the series diverges by the $n$-th term test.

**(ii)** Since $\displaystyle\int_{2}^{\infty} \frac{dx}{x(\ln x)^2} = \left( -\frac{1}{\ln x} \Big|_{2}^{\infty} \right) < \infty$, the series converges by the integral test.

**(iii)** $\displaystyle\sum_{n=0}^{\infty} \frac{1}{(n + 2019)(n + 2020)} = \sum_{n=0}^{\infty} \left( \frac{1}{n + 2019} - \frac{1}{n + 2020} \right) = \frac{1}{2019}$.