Problem 1  (5 points) Does the following series converge? If it converges, find out the value.

\[ \sum_{n=1}^{\infty} \arctan n \]

Problem 2  (5 points) Does the following series converge? If it converges, find out the value. (Hint: telescoping sum.)

\[ \sum_{n=2}^{\infty} \frac{1}{n(n - 1)} \]
Problem 3  (5 points) Find the range of $x$ for which the following series converges.

$$
\sum_{n=1}^{\infty} \frac{(x + 1)^n 2^n}{3^n}
$$

Problem 4  (5 points) Decide whether the following series converges.

$$
\sum_{n=1}^{\infty} \frac{n + \sin(\cos(n))}{\sqrt{n^3 + n}}
$$