**1.** Let $C$ be the curve $(t + \sin t, 1 - \cos t)$, $0 \leq t \leq \pi$. Find the length of the $C$.

**2.** The sequence $\{a_n\}$ is defined as follows

$$a_1 = 2, \quad a_{n+1} = \frac{3 + a_n}{5 - a_n} \text{ for } n \geq 1$$

a/ Show that for any $n$, $1 < a_n < 3$.
b/ Show that $\{a_n\}$ converges and find its limit.

**3.** Determine whether the series $\sum_{n=2}^{\infty} \frac{\tan(1/n)}{\sqrt{n}}$ converges or diverges.

**4.** Find the series representation of $\ln(\frac{1+x}{5-2x})$ in powers of $x - 2$. Find the interval of convergence of the series.

**5.** Find the value of

$$\sum_{n=1}^{\infty} \frac{n+1}{n2^n}.$$