Read directions carefully and show your work. Partial credit will be assigned based upon the correctness, completeness, and clarity of your answers.

1. Consider $\sum_{k=3}^{\infty} \left( \frac{\pi}{e} \right)^k$. Does the series converge or diverge? If the series converges find its sum.

2. Consider $\sum_{k=0}^{\infty} \frac{e^k}{e^{2k} + 1}$. Does the series converge or diverge? Explain why.

3. Consider $\sum_{k=1}^{\infty} \left( \frac{1}{\sqrt{k}} - \frac{1}{\sqrt{k+1}} \right)$.

   (a) Find the first 3 terms for the sequence of partial sums: $S_1$, $S_2$, and $S_3$ for the series above. DO NOT USE A CALCULATOR TO CONVERT YOUR ANSWER TO DECIMALS.

   (b) Use part (a) to find a formula for the $n^{th}$ partial sum, $S_n$.

   (c) Find $\lim_{n \to \infty} S_n$. What does this tell you about $\sum_{k=1}^{\infty} \left( \frac{1}{\sqrt{k}} - \frac{1}{\sqrt{k+1}} \right)$?