1. Explain why the decimal number 0.232323... can be represented by the series $\sum_{k=1}^{\infty} \frac{23}{10^{2k}}$.

Compute the sum of the series as a fraction in simplified form.

$$0.232323... = \frac{23}{100} + \frac{23}{100^2} + \frac{23}{100^3} + \ldots = \sum_{k=1}^{\infty} \frac{23}{100^k} = \sum_{k=1}^{\infty} \frac{23}{10^{2k}}$$

$$= \frac{23}{100} \sum_{k=1}^{\infty} \frac{1}{100^{k-1}} = \frac{23}{100} \cdot \frac{1}{1 - \frac{1}{100}} = \frac{23}{99}$$

2. Use the integral test to determine if the series $\sum_{k=2}^{\infty} \frac{1}{k(\ln k)^2}$ is convergent or divergent.

Let $f(x) = \frac{1}{x(\ln x)^2}$. We have

$$\int_{2}^{\infty} f(x) \, dx = \int_{2}^{\infty} \frac{du}{u^2} = -\frac{1}{u} \bigg|_{\ln 2}^{\infty} = \frac{1}{\ln 2}$$

By the integral test, the series is convergent.