$$1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \cdots + \frac{1}{4^n} =$$

$$1 + \frac{1}{3}\left(1 - \frac{1}{4^n}\right) \quad 1 + \frac{1}{k} + \frac{1}{k^2} + \frac{1}{k^3} + \cdots + \frac{1}{k^n}$$

$$\lim_{n \to \infty}\left[1 + \frac{1}{3}\left(1 - \frac{1}{3^n}\right)\right] = 4/3$$

$$\lim_{\substack{n \to \infty \\ k \to \infty}} = \left[1 + \left(\frac{1}{k-1}\right)\left(1 - \frac{1}{k^n}\right)\right] =$$

$$1+\frac{1}{K}+\frac{1}{K^2}+\frac{1}{K^3}+\cdots+\frac{1}{K^w}=$$

$$\left[1+\left(\frac{1}{K-1}\right)\left(1-\cancel{\frac{1}{K^w}}\right)\right] \quad 1+\frac{1}{K-1} \quad \frac{K\cancel{-1+1}}{K-1}$$

$$\frac{1}{2}=2 \qquad \frac{1}{4}=\frac{4}{3}$$

$$\frac{1}{3}=\frac{3}{2} \qquad =\left(\frac{K}{K-1}\right)=\left(\frac{1}{1-\frac{1}{K}}\right)$$