

Question

The product operator \prod , is defined as

$$\prod_{i=1}^k [u_i] = u_1 \times u_2 \times u_3 \times u_4 \times \dots \times u_{k-1} \times u_k .$$

A sequence of numbers, $P(1), P(2), P(3) \dots P(n)$ is defined by the equation

$$P(n) = \frac{9}{10} \prod_{r=1}^n \left[1 + \left[\sum_{k=1}^r 10^k \right]^{-1} \right] .$$

Express $P(n)$ in a simplified form not involving a sigma or product operators.