Problem Set 1

Fractals

October 6, 2021

1. Let A, B and C be digits, and assume $A \neq 0$, if $AA + BB + CC = ABC$, what are A, B and C?
2. Find the value of $\frac{1}{3^2+1} + \frac{1}{4^2+2} + \frac{1}{5^2+3} + \dots$
3. Let $f(x) = 1 + x + x^2 + x^3 + \cdots + x^{100}$.Find $f'(1)$
4. Two reals x and y are such that $x - y = 4$ and $x^3 - y^3 = 28$ compute xy
5. For each positive integer n, let $f(n) = \frac{n}{n+1} + \frac{n+1}{n}$. Then $f(1) + f(2) + f(3) + \cdots + f(10)$ can be expressed as $\frac{m}{n}$ where m and n are relatively prime positive integers. Compute $m + n$.