



1. Let f be a function over the domain of all positive real numbers such that

$$f(x) = \frac{1 - \sqrt{x}}{1 + \sqrt{x}}$$

Now, let $g(x)$ be the function given by

$$g(x) = f(x)^{\frac{2f(\frac{1}{x})}{f(x)}}$$

$g(100)$ can be expressed as a fraction $\frac{a}{b}$ where a and b are relatively prime integers. What is the sum of a and b ?

2. Define the *factorial function* of n , denoted $\partial(n)$, as the sum of the factorials of the digits of n . For example, $\partial(2024) = 2! + 0! + 2! + 4! = 29$. There are four positive integers such that $\partial(\partial(n)) = n$ and $\partial(n) \neq n$. Given that $n = 871$ is one of them, compute the sum of the other three.

Indiv ID: _____

Team ID: _____

1. _____

2. _____

- 10 minutes
- no calculators
- positive integer answers
- ranking will be determined by score, then by time