Problem

5,915,587,277 is the difference between two squares. What are those numbers? In other words, find a and b such that

$$a^2 - b^2 = 5,915,587,277$$

Hint: 5,915,587,277 is a prime number.

Solution

$a^2 - b^2 = (a + b)(a - b)$. Given that the result is prime, it follows that either $a + b$ or $a - b$ must be 1 and the other quantity must equal the product (otherwise their product is not prime). The only possibility that works is $a - b = 1$ and $a + b = 5,915,587,277$ so $a = 2,957,793,639$ and $b = 2,957,793,638$.