1. [3] Find the largest \( n \) such that the last nonzero digit of \( n! \) is 1.

2. [3] Define a sequence \( a_n \) such that \( a_n = a_{n-1} - a_{n-2} \). Let \( a_1 = 6 \) and \( a_2 = 5 \). Find \( \sum_{n=1}^{1000} a_n \).

3. [4] Evaluate \( \sqrt[3]{26} + 15\sqrt{3} + \sqrt[3]{26} - 15\sqrt{3} \).

4. [4] If \( x, y, \) and \( z \) are real numbers with \( \frac{x-y}{z} + \frac{y-z}{x} + \frac{z-x}{y} = 36 \), find

\[
2012 + \frac{x-y}{z} \cdot \frac{y-z}{x} \cdot \frac{z-x}{y}
\]

5. [5] Considering all numbers of the form \( n = \lfloor \frac{k^3}{2012} \rfloor \), where \( \lfloor x \rfloor \) denotes the greatest integer less than or equal to \( x \), and \( k \) ranges from 1 to 2012, how many of these \( n \)'s are distinct?


\[
\sum_{n=1}^{\infty} \frac{n+1}{n^2(n+2)^2}
\]

Your answer in simplest form can be written as \( \frac{a}{b} \), where \( a, b \) are relatively-prime positive integers. Find \( a + b \).

7. [7] Let \( f \) be a polynomial of degree 3 with integer coefficients such that \( f(0) = 3 \) and \( f(1) = 11 \). If \( f \) has exactly 2 integer roots, how many such polynomials \( f \) exist?

8. [8] Let \( a_n \) be a sequence such that \( a_1 = 1 \) and \( a_{n+1} = \lfloor a_n + \sqrt{a_n} + \frac{1}{2} \rfloor \). What are the last four digits of \( a_{2012} \)?