1. Roy is starting a baking company and decides that he will sell cupcakes. He sells \( n \) cupcakes for \((n + 20)(n + 15)\) cents. A man walks in and buys \$10.50 worth of cupcakes. Roy bakes cupcakes at a rate of 10 cupcakes an hour. How many minutes will it take Roy to complete the order?

2. Let \( f \) be a function which takes in 0, 1, 2 and returns 0, 1, or 2. The values need not be distinct: for instance we could have \( f(0) = 1, f(1) = 1, f(2) = 2 \). How many such functions are there which satisfy:
   \[ f(2) + f(f(0)) + f(f(f(1))) = 5 \]

3. Andrew and Blair are bored in class and decide to play a game. They pick a pair \((a, b)\) with \(1 \leq a, b \leq 100\). Andrew says the next number in the geometric series that begins with \(a, b\) and Blair says the next number in the arithmetic series that begins with \(a, b\). For how many pairs \((a, b)\) is Andrew’s number minus Blair’s number a positive perfect square?

4. There are real numbers \(a, b, c, d\) such that for all \((x, y)\) satisfying \(6y^2 = 2x^3 + 3x^2 + x\), if \(x_1 = ax + b\) and \(y_1 = cy + d\), then \(y_1^2 = x_1^3 - 36x_1\). What is \(a + b + c + d\)?

5. Find the sum of the non-repeated roots of the polynomial \(P(x) = x^6 - 5x^5 - 4x^4 - 5x^3 + 8x^2 + 7x + 7\).

6. Define the sequence \(a_i\) as follows: \(a_1 = 1, a_2 = 2015, a_n = \frac{na_{n-1} - 1}{a_n + na_{n-2}}\) for \(n > 2\). What is the least \(k\) such that \(a_k < a_{k-1}\)?

7. We define the function \(f(x, y) = x^3 + (y - 4)x^2 + (y^2 - 4y + 4)x + (y^3 - 4y^2 + 4y)\). Then choose any distinct \(a, b, c \in \mathbb{R}\) such that the following holds: \(f(a, b) = f(b, c) = f(c, a)\). Over all such choices of \(a, b, c\), what is the maximum value achieved by:
   \[ \min(a^4 - 4a^3 + 4a^2, b^4 - 4b^3 + 4b^2, c^4 - 4c^3 + 4c^2) \]

8. We define the ridiculous numbers recursively as follows:
   
   (a) 1 is a ridiculous number.
   
   (b) If \(a\) is a ridiculous number, then \(\sqrt{a}\) and \(1 + \sqrt{a}\) are also ridiculous numbers.

A closed interval \(I\) is “boring” if

- \(I\) contains no ridiculous numbers, and
- There exists an interval \([b, c]\) containing \(I\) for which \(b\) and \(c\) are both ridiculous numbers.

The smallest non-negative \(l\) such that there does not exist a boring interval with length \(l\) can be represented in the form \(\frac{a + b\sqrt{c}}{d}\) where \(a, b, c, d\) are integers, \(\gcd(a, b, d) = 1\), and no integer square greater than 1 divides \(c\). What is \(a + b + c + d\)?