All answers should be as simple as possible.

1. What is the total number of additions done in Step 3 of Algorithm 1.4 when it is used to add two \( n \)-digit integers.

2. Write code in the style of the text book for a modified version of Algorithm 1.4 that adds an \( m \)-digit integer to an \( n \)-digit integer \( m \leq n \) that is fast when \( n \) is much bigger than \( m \).

3. Simplify \( \sum_{1 \leq i \leq n} i^4 \).

4. Let \( x^9 + x = y \). Write an approximation to the solution to this equation for large \( y \) where your solution should go to infinity about as fast as \( y^{1/9} \).

5. Consider algorithms \( A \) and \( B \) that solve the same problem where the problem is characterized by parameters \( m \) and \( n \), where \( m \leq n \). The running time for algorithm \( A \) is given by

\[
T_A(m, n) = mn + m.
\]

When both \( m \) and \( n \) are even, the running time for algorithm \( B \) is given by

\[
T_B(m, n) = T_A(m/2, m/2) + T_A(m/2, n - m/2) + T_A(m/2 + 1, n - m/2) + m + 3n/2.
\]

Write an expression that depends on \( m \) and \( n \) and that is true if and only if \( T_A(m, n) \leq T_B(m, n) \). The expression needs to apply only when \( m \) and \( n \) are even.