1. Circle T if the corresponding statement is True or F if it is False.
T  F  The sequence {1, 4, 5, 9, 14, 23, 37,...} satisfies the Fibonacci relation.
T  F  The First (Weak) and Second (Strong) Principles of Mathematical Induction are logically equivalent.
T  F  A recursive algorithm is one which refers to itself.
T  F  Functions that are O(x^{10}) grow faster than functions that are O(2^x).

2. Let \{a_n\} and \{b_n\} be the sequences defined, for n \geq 0, by:
\[ a_n = n^2 + 2, \text{ and } b_n = (-1)^{(n+1)}. \]
Find \(c_0, c_1, c_2, \text{ and } c_3 \) when \(c_n = (a_n)(b_n)\).

3. Trace the Division Algorithm to find (37 DIV 12) and (37 MOD 12).

4. (a) Rank from 1 (least complex) to 10 (most complex) the complexity of algorithms with the following orders:
Order  \(n^2\)  \(n\log n\)  \(n^!\)  \(2^n\)  \(n^n\)  \(\log n\)  \(10^n\)  \(n^{10}\)
Rank
(b) Find the Big-Oh of the algorithm with complexity: \((n^7 + 1)(3n + n^3) + (4n^2 + 2n^3 + 6)(n^6)\).

5. Use the Euclidean Algorithm to find GCD(1060,160).

6. Prove one of the two Theorems below using Mathematical Induction.
**Theorem 1**: For all integers \(n \geq 0\) and \(a \neq 0,1\), \[ \sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}. \]
**Theorem 2**: If \(a_0 = 2\) and \(a_1 = 4\), then \(a_n = a_{n-1} + a_{n-2}\) is divisible by 2.

7. Prove one of the two Theorems below:
**Theorem 1**: The difference of the squares of an integer and its predecessor is odd.
**Theorem 2**: If \(a\) and \(b\) are Integers with \(a < b\), then there is a Rational, \(q\), such that \(a < q < b\).

8. Prove one of the two Theorems below by Contradiction.
**Theorem 1**: The sum of any rational number and any irrational number is irrational.
**Theorem 2**: For all Naturals \(n\) and primes \(p\), if \(p\) divides \(n\), then \(p\) does not divide \((n + 1)\).