For each exercise, a maximum of 25 points is assigned. Please give reasons for your answers!

1. How many ways to remove three elements from the sequence
   
   \[1 \ 4 \ 2 \ 5 \ 7 \ 3 \ 8 \ 9,\]
   
   are there, to make the remaining numbers form an increasing sequence?

2. Translate the following logical formula into a disjunctive normal form:

\[\left( \left( u \land y \right) \lor \left( \neg u \land \neg y \right) \right) \land \left( \neg \left( x \lor z \right) \right) \land \left( \neg z \right)\]

The characters \(x, y, z, u\) stand for logical variables, the sign \& denotes a logical conjunction, the sign \lor denotes a logical disjunction, and \neg x denotes the negation of the variable \(x\).

3. Design a deterministic finite state automaton over the input alphabet \(\{0, 1\}\) that accepts words of length at least two which contain even number of 0s and odd number of 1s. For example, words 001, 111111, 0101010 are accepted whereas words 1, 00001, 100101 are rejected. Please write a transition function in the form of a table and draw the automaton in the form of a transition diagram. Design a simplest automaton accepting this language, that is, an automaton with the lowest possible number of states.

4. Let us have the following program (both codes, in Pascal and in C language, are equivalent):

```pascal
program AAA;
var A, B, C: integer;
begin
  read(A, B);
  while A > B do
  begin
    A := A - 2;
  end;
  while B > A do
  begin
    B := B - 2;
  end;
  C := A + B;
  writeln(C)
end.
```

```c
main() /* AAA */
{ int a, b, c;
  scanf("%d %d", &a, &b);
  while (a > b)
  { a -= 2;
  }
  while (b > a)
  { b -= 2;
  }
  c = a + b;
  printf("%d", c);
}
```

Determine how the resulting value of the variable \(C\) (i.e., the output of the program) depends on the input values of the variables \(A\) and \(B\).