CS2022/MA2201
HW#4 SOLUTIONS

1. For a worst-case instance $A[k] \le A[k+1]$, $0 \le k < n-1$, the algorithm requires $2n-3$ comparisons.

2. **b**) n multiplications and n additions

3. **a**) $n-1$
b) 1
c) $\lfloor \log_2 n \rfloor + 1$

4. **a**) simplification
b) disjunctive syllogism
c) modus ponens
d) addition
e) hypothetical syllogism

5. **THEOREM**: The sum of any two rational numbers is a rational number.
PROOF: Let x and y be any two rational numbers. Then there must exist integers p, q, r and s such that $x=p/q$ and $y=r/s$. Then $x+y=\frac{p}{q}+\frac{r}{s}=\frac{(sp)+(qr)}{qs}$. Since p, q, r and s are integers, then so are $sp+qr$ and qs, and hence $x+y$ can be expressed as the ratio of integers and it must be a rational number.