1. (4 points) Let $S = \{-1, 0, 2, 4, 7\}$. Find $f(S)$ if
   a) $f(x) = 1$
   b) $f(x) = 2x + 1$
   c) $f(x) = \left\lceil \frac{x}{5} \right\rceil$
   d) $\left\lfloor \frac{x^2 + 1}{3} \right\rfloor$

2. (4 points) Find $\sum_{k=100}^{200} k$.

3. (5 points) Prove that the intervals $[0,1]$ and $[2,4]$ have the same cardinality.

4. (5 points) Prove that if $A$, $B$, and $C$ are sets such that $|A| \leq |B|$ and $|B| \leq |C|$, then $|A| \leq |C|$.

5. (6 points) Prove by mathematical induction that $3^n < n!$ for all integers $n \geq 7$. (Recall that $n!$ is the product of all positive integers less than or equal to $n$, that is, $n! = 1 \cdot 2 \cdots (n-1) \cdot n$.)

6. (6 points) Prove by mathematical induction that $n^2 - 7n + 12$ is nonnegative for all integers $n \geq 3$. 

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