For each of the two problems, give a many-one (recursive) reduction function \( \sigma \) that does the reduction, and include the 3-part argument that it does the reduction.

**Question 1. [30 points]**

Show \( A \leq_m B \), where the alphabet \( \Sigma = \{0, 1\} \), and

\[
A = \{x \in \{0, 1\}^* \mid |x| \text{ is even}\}
\]

\[
B = \{x \in \{0, 1\}^* \mid |x| \text{ is odd}\}.
\]
Question 2. [70 points] Show $HP \leq_m B$, where

$$B = \{ i \mid \overline{L(M_i)} \text{ is infinite} \}.$$