1. Prove the following:

   (a) Prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

   (b) If n is odd, then n^2 is odd

   (c) Prove that the sum of a rational and an irrational number is irrational

2. Suppose that $\Sigma = \{0, 1\}$. Verbally describe the following languages:

   (a) Σ^3

   (b) $\Sigma^0 \cup \Sigma^1 \cup \Sigma^2$

   (c) $\Sigma^1 \cap \Sigma^3$

   (d) $\{0x \mid x \in \Sigma^*\}$

   (e) $\{x1 \mid x \in \Sigma^*\}$

   (f) $\{x01y \mid x, y \in \Sigma^*\}$

3. For the languages in 2., state which of these languages contain the empty string ϵ