CSC236 tutorial exercises, Week #2
(best before Thursday afternoon)

Solve question 1, then prove claims 2–4 using Mathematical Induction (AKA Simple Induction).

1. Define $P(n)$ as:

$$\sum_{i=0}^{i=n} 2^i = 2^{n+1}$$

   (a) Prove that $P(115)$ implies $P(116)$.

   (b) Is $P(n)$ true for every natural number n? Explain why, or why not.

2. $\forall n \in \mathbb{N}$, $8^n - 1$ is a multiple of 7.

3. $\forall n \in \mathbb{N}, \exists m \in \mathbb{N}$, the units digit of 7^n is the same as the units digit of 3^m.

4. $\exists m \in \mathbb{N}, \forall n \in \mathbb{N}, n \geq m \Rightarrow 4^n \geq 5n^4 + 6$