Math 2534 Homework 7 Spring 2018

Prove the following theorems using PMI. The write up needs to be complete by using sentences to explain and justify your presentation.

Theorem 1: $\forall n \in N,\ 1 + a + a^2 + a^3 + ... + a^{n-1} = \dfrac{a^n - 1}{a - 1}$ ($a \neq 0$ is some unknown real number.)

Theorem 2: $\forall n \in N,\ 3 \mid (4^n - 1)$

Theorem 3: $\forall n \in N, n \geq ?,$ (n +1)! > 2^{n+3}

(first determine the smallest value for which this theorem would be true.)

Theorem 4: $\forall n \in N, n \geq ?,$ 2n + 3 $\leq$ 2^n

(first determine the smallest value for which this theorem would be true.)

Theorem 5: A jigsaw puzzle that has n pieces can be completed in using n – 1 fits.

Definition: A "fit" is defined to be one more puzzle piece added to already assembled puzzle pieces at a given point in time.