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9. (i) $f(n) = 7^n(3n + 1) - 1$

Prove by induction that, for $n \in \mathbb{Z}^+$, $f(n)$ is a multiple of 9

(6)

(ii) A sequence of numbers is defined by

$$u_1 = 2 \qquad u_2 = 6$$

$$u_{n+2} = 3u_{n+1} - 2u_n \qquad n \in \mathbb{Z}^+$$

Prove by induction that, for $n \in \mathbb{Z}^+$

$$u_n = 2(2^n - 1)$$

(6)

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