Thepakorn Prayonrat 67011352.

Proof that for $\forall n \in \mathbb{Z}^+$ n is even $\Leftrightarrow 7n+4$ is even

Proof: Proof by biconditional.

Proof n is even $\rightarrow 7n+4$ is even

n is even $\therefore n = 2x ; \exists x \in \mathbb{Z}$

$\therefore 7n+4 = 7(2x)+4 = 14x+4 = 2(7x+2) = 2y ; \exists y = 7x+2 \in \mathbb{Z}$

$\therefore n$ is even $\rightarrow 7n+4$ is even.

Proof $7n+4$ is even $\rightarrow n$ is even.

Proof by contrapositive: n is odd $\rightarrow 7n+4$ is odd

n is odd $\therefore n = 2x+1 ; \exists x \in \mathbb{Z}$

$\therefore 7n+4 = 7(2x+1)+4 = 14x+7+4 = 14x+11 = 2(7x+5)+1 = 2y+1 ; \exists y \; 7x+5 \in \mathbb{Z}$

$\therefore 7n+4$ is even $\rightarrow n$ is even

$\therefore$ We can conclude that

" $\forall n \in \mathbb{Z}$, n is even $\Leftrightarrow 7n+4$ is even " #