Problem of the Week-4: Last Digits of Squares

For any positive integer $n$ in base 10, we know that $n^2$ ends with 0 (the units digit is 0) if and only if $n$ itself ends with 0. Now consider numbers written in base $b$, where $5 \leq b \leq 9$. Determine for which bases $b$ (if any) the following statement is true.

For any positive integer $n$, $n^2$ ends with 0 if and only if $n$ ends with 0.

As always, prove your answer.

Posting Date 2/21/13. Submit solutions to Noah Aydin, Mathematics Department, RBH 319 (e-mail or hard-copy, but hard copy submissions must include a time stamp) by 4 pm on 3/1/13 (extended until 3/21).