Name: _____

(1) Compute the following
   (a) 123 div 7
   (b) 123 mod 7
   (c) -12 div 7
   (d) -12 mod 7
(2) Use the Division Algorithm to prove that every integer is either even or odd. *[I said earlier that we would have to wait for induction to prove this fact. That's sort of right, because the proof of the Division Algorithm relies on induction.]*
(3) Use the Division Algorithm and cases to prove: for every odd integer n, $n^2 \equiv 1 \pmod 8$. *[Hint: consider n mod 4.]*
(4) In $\mathbb{R}$ and $\mathbb{Z}$, we have the *zero product rule*: $xy = 0$ if and only if $x = 0$ or $y = 0$. Does the zero product rule hold in $\mathbb{Z}_2$? $\mathbb{Z}_3$? $\mathbb{Z}_4$? $\mathbb{Z}_5$? $\mathbb{Z}_6$? Conjecture an answer to the question: for which n does $\mathbb{Z}_n$ have the zero product rule?