CSC 501 - Assignment #5
version 4.0

Due Thursday 11/10/16 in Sakai

Problems

1. As discussed in class Prolog implements a *remainder* operation for integer division:

   ```
   +IntExpr1 rem +IntExpr2
   ```

   That is, 3 `rem` $2 = 1$ and 4 `rem` $2 = 0$, *etc.* Use this operation to implement the two operators,
   $$B \rightarrow \mathbf{even}(A) \mid \mathbf{odd}(A)$$
   in the semantic specification given in class where A is the nonterminal for the arithmetic expressions and B the nonterminal for the boolean expressions. Show that your specification works by computing the semantic value of some example expressions.

2. Show that the expressions $\mathbf{odd}(a)$ and $\mathbf{even}(\mathbf{add}(a, 1))$ are semantically equivalent for all $a \in \mathbf{Aexp}$ using Prolog. Write a proof score and show that your proof score works.

3. Construct an inductive proof in Prolog that demonstrates that all computations on boolean expressions produce a value of either **true** or **false**.

4. Implement the semantics of the **do - while** loop from Assignment #1 in the Prolog specification using the syntax,

   $$C \rightarrow \mathbf{dowhile}(C, B)$$

   Here C are commands and B are boolean expressions. The informal specification of this command is that c is executed as long as the boolean expression remains **true**. Demonstrate that your semantics work with some examples.

Hand in copies of your language specification and all relevant proof scores and runs.