CSCC63 – Week 3 Tutorials

There are several questions here, you aren't expected to finish all of them today. But they'll be good practice for you.

1. Repeat the PCP problem from last week, but this time you want to set up the PCP instance to be a *yes*-instance iff the input graph $G = (V, E)$ has a cycle.

2. Describe an effective enumeration on the alphabet $\{a, b, c\}$. What would the 10^{th} string in this enumeration be? How long would you have to run it to get the string $aaabbc$?

3. Consider the problem of determining whether a given TM running on a given input ever tries to move its head off of the left hand side of the input tape. Formulate this problem as a language and show that it is undecidable.

4. *If there's no time in tutorial, think about this problem on your own:*

   Is the following function computable?

   $$f(n) = \begin{cases} 1, & \text{if the decimal expansion of } \pi \text{ contains } n \text{ consecutive } 5\text{s,} \\ 0, & \text{otherwise.} \end{cases}$$

   Hint: problem 3.22 from Sipser (about life on Mars)