## MAU11602 first quiz, week 2, Wed 2/2/22 due on Blackboard, 12 noon, Wed 9/2/22

## Rules and procedures.

1. Attempt 3 questions. Only *your first three answers* will be marked. 2. Each question carries 20 marks, so the maximum quiz mark is 60. 3. If a particular method of solution is stipulated, you get no marks if you don't use it. 4. *Show all work.* No marks will be given for answers which do not show the calculations. 5. Your answers should be scanned and submitted to Blackboard.

All turing machines must conform to the pattern required for the turinginC program. Also, if and when a machine terminates, the square being scanned should contain the leftmost nonblank tape symbol (blank if the tape is blank).

Question 1. Give a Turing machine which increments ternary strings: the input alphabet is  $\{0, 1, 2\}$ . It should loop on empty input.

**Question 2.** Give a Turing machine which multiplies binary strings by 4. It should loop on empty input.

Question 3. Give a Turing machine which reverses binary strings.

**Question 4.** Add comments to the Turing machine below. What is the domain of the partial function?

 q0
 0
 B
 R
 q1

 q0
 1
 B
 R
 q2

 q1
 0
 B
 R
 q1

 q1
 1
 B
 R
 q2

 q1
 B
 B
 L
 q3

 q2
 B
 B
 L
 q3

 q2
 0
 B
 R
 q4

 q2
 1
 B
 R
 q4

 q4
 0
 B
 R
 q4

 q4
 1
 B
 R
 q4

 q4
 B
 B
 L
 q4

**Question 5.** Below is an encoding of a Turing machine. Translate it into recognisable quintuples. What does the machine do?