

## HOMEWORK #5

DATE: MARCH 4, 2020 : DUE: MARCH 18, 2020

In the following problems provide a complete explanation of why it is true

- (1) Let  $n$  be an integer. Justify the following statements.
  - (a) The last digit of  $n$  is even if and only if  $n$  is divisible by 2.
  - (b) The last two digits of  $n$  are divisible by 4 if and only if  $n$  is divisible by 4.
  - (c) The last three digits of  $n$  are divisible by 8 if and only if  $n$  is divisible by 8.
  - (d) The last  $k$  digits of  $n$  are divisible by  $2^k$  if and only if  $n$  is divisible by  $2^k$ .
  
- (2) Let  $n$  be an integer. Justify the following statements.
  - (a) The integer  $n$  is divisible by 3 if and only if the sum of the digits is divisible by 3.
  - (b) The integer  $n$  is divisible by 9 if and only if the sum of the digits is divisible by 9.
  
- (3) What is the last nonzero digit at the end of  $10!$  ? What is the last nonzero digit at the end of  $100!$  ? What is the last nonzero digit at the end of  $1,000,000!$  ? Describe a procedure for finding the last non-zero digit at the end of  $n!$  for any  $n$ . Use that procedure to find the last non-zero digit for the factorial of your student id number.