Python for Math and Stat

Write your name below. This exam is worth 50 points. You are not allowed the use of any electronic devices for this exam. You may assume that any necessary libraries have already been imported and that any strings used for input are all lower case.

Name:

1. (20 pts, 5 each) For the following 4 problems, write down what each code block would display if executed in a Jupyter cell.

   (a)
   ```
   alist = [x**2 % 2 for x in range(4)]
   alist[2] = 2
   alist
   ```

   Solution: [0, 1, 2, 1]

   (b)
   ```
   word = 2*'vu' + 'zela'
   word[2:6]
   ```

   Solution:
   ```
   'vuze'
   ```

   (c)
   ```
   x = 0
   for k in range(1,4):
       x += (-1)**k * k
       print(x)
   x
   ```

   Solution:
   ```
   -1
   1
   -2
   -2
   ```

   (d)
   ```
   tup = (29 , 3)
   tup[0] // tup[1], tup[1] // tup[0]
   ```

   Solution:
   (9, 0)

2. (10 pts) The natural logarithm function, $\ln(x)$, can be expressed as the series

   $$\ln(x) = (x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \ldots$$

   Write a function called approximate_ln(x,n) that calculates and returns the sum of the first n terms of this series.

   For example approximate_ln(2,5) would return 0.783333.

   Solution: This problem is very similar to the second problem on HW4. If we choose our for loop to be in range(n), then we have

   ```
   def approximate_ln(x,n):
       total = 0
       for i in range(n):
           total += (-1)**i*(x-1)**(i+1)/(i+1)
       return total
   ```

3. (10 pts) A palindrome is a word or number that is the same when read forwards or backwards. For example, 'eve' and 'radar' are palindromes, as is the number 15351. Write a function called check_palindrome(word) that takes either a string or integer as the input and returns the boolean value True if it is a palindrome and False if it is not. You may assume input strings are all lower case.

   For example, check_palindrome('racecar') would return True while check_palindrom(123) would return False.

   Solution: We need to make sure to convert the input into a string if it is an integer, since integers are not iterable:

```
def check_palindrome(word):
    if isinstance(word, int):
        word = str(word)
    return word == word[::-1]
```

4. (10 pts) Write a function called create_username(tuplist) which creates a list of student usernames from a list of tuples. The tuples in the list are in the format (first name, last name, student ID number). (The names are strings while the ID is an integer.) The username is the string starting with the first letter of the students first name, then the last three letters of the last name, and finally the last 4 digits of the student ID number.

   For example, a list element with the tuple (`’colin’`,`’mitchell’`,18731138) would give the username `’cell1138’`.

   Solution: For each entry in the list of tuples, we must unpack the tuple and create the username:

```
def create_username(tuplist):
    usernamelist = []
    for tup in tuplist:
        first, last, idnum = tup
        usernamelist.append(first[0] + last[-3:] + str(idnum)[-4:] )
    return usernamelist
```