

# 期末考试试题：第二部分

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## T1

### (1)请为函数find\_name\_value 拟一个功能描述。

该函数的功能是将一个字符串分割为名字和数值两部分,其中数值以末尾加n表示负数, 不加n表示正数。

以下是一些不符合要求情况的特殊处理

- 当该字符串没有数值位时，函数仅返回名字值，而数值返回为空
- 当该字符串末尾的格式不正确，即衔接了一串字符串，那么视作数值为正

## (2)

```
import re
```

```
def find_name_value(folder_name):
```

```
    '''Split the name of a data directory into a (name, value) tuple.
```

```
    The format of ``folder_name``:
```

```
        <name><value>
```

```
    If the value is negative, it should be followed by a 'n'.
```

```
    Examples:
```

```
        ::
```

```
        phi0.1          # should return 'phi', 0.1
        xN14.2          # should return 'xN', 14.2
        kappa0.5n       # should return 'kappa', -0.5
```

```
    Args:
```

```
        folder_name (str): the name of a :term:`data directory`.
```

```
    Returns:
```

```
        tuple: a tuple contains:
```

```
        * name (str): variable name.
        * value (float): value of the variable.
```

```
    ...
```

```
    pattern = '([-+]?\\d*\\.\\d+|([-+]?\\d+))'
```

```
    rst = re.split(pattern, folder_name)
```

```
    if len(rst) < 2:
```

```
        return folder_name, None
```

```
    name = rst[0]
```

```
    valuestr = rst[1]
```

```
    sign_str = ''
```

```
    if len(rst) > 2:
```

```
        sign_str = rst[2]
```

```
    if sign_str == 'n':
```

```
        value = '-' + valuestr
```

```
    else:
```

```
        value = valuestr
```

```
    return name, float(value)
```

```
test = ["abc15", "KFCCRAZYTHURSDAY_VIVO50", "int0.55", "name1.14n", "no_value", "signerror"]
```

```
for folder_name in test:
    name, value = find_name_value(folder_name)
    if (value != None):
        print("%s -> %s %f" % (folder_name, name, value))
    else:
        print("%s -> %s None" % (folder_name, name))
```

用以上代码来检验函数功能，输出如下：

```
abc15 -> abc 15.000000
KFCCRAZYTHURSDAY_VIVO50 -> KFCCRAZYTHURSDAY_VIVO 50.000000
int0.55 -> int 0.550000
name1.14n -> name -1.140000
no_value -> no_value None
signerror404dgserg -> signerror 404.000000
test111 -> test 111.000000
abc123def456 -> abc 123.000000
name165151 -> name 165151.000000
nine9n -> nine -9.000000
```

可见程序功能基本正确，然而在输入为"name-165151n"时则会报

错：ValueError: could not convert string to float: '--165151'

这是由于代码没有考虑两个负号同时出现的情况导致的，我们将对函数进行修改。

```

import re

def find_name_value(folder_name):
    '''Split the name of a data directory into a (name, value) tuple.

    The format of ``folder_name``:

        <name><value>

    If the value is negative, it should be followed by a 'n'.

    Examples:
        ::

            phi0.1          # should return 'phi', 0.1
            xN14.2          # should return 'xN', 14.2
            kappa0.5n       # should return 'kappa', -0.5

    Args:
        folder_name (str): the name of a :term:`data directory`.

    Returns:
        tuple: a tuple contains:

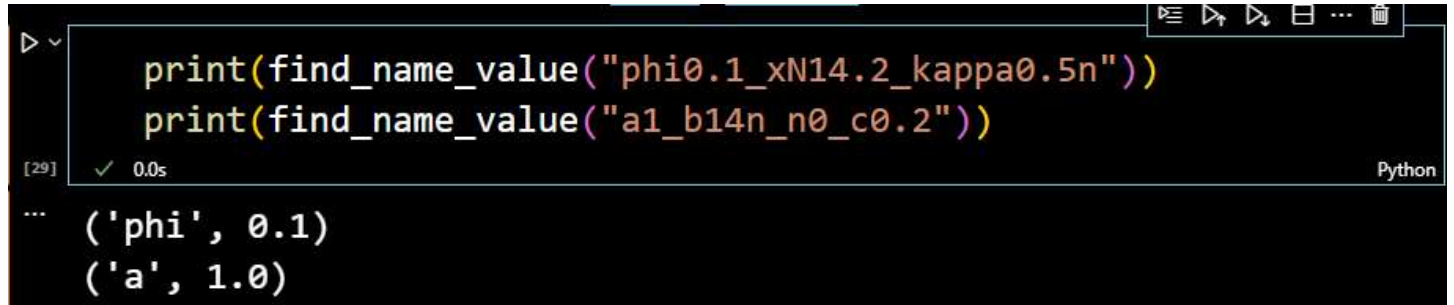
        * name (str): variable name.
        * value (float): value of the variable.
    '''
    pattern = '([-+]?\\d*\\.\\d+|([-+]?\\d+)'
    rst = re.split(pattern, folder_name)
    if len(rst) < 2:
        return folder_name, None
    name = rst[0]
    valuestr = rst[1]
    sign_str = ''
    if len(rst) > 2:
        sign_str = rst[2]
    if sign_str == 'n':
        #修改部分
        #-----
        if (valuestr != None):
            if (valuestr[0] != '-'):
                valuestr = '-' + valuestr
            else:
                valuestr = valuestr[1:]
        #-----
    value = valuestr

```

```
return name, float(value)
```

这样即可避免问题

### (3)



```
print(find_name_value("phi0.1_xN14.2_kappa0.5n"))
print(find_name_value("a1_b14n_n0_c0.2"))
```

[29] ✓ 0.0s Python

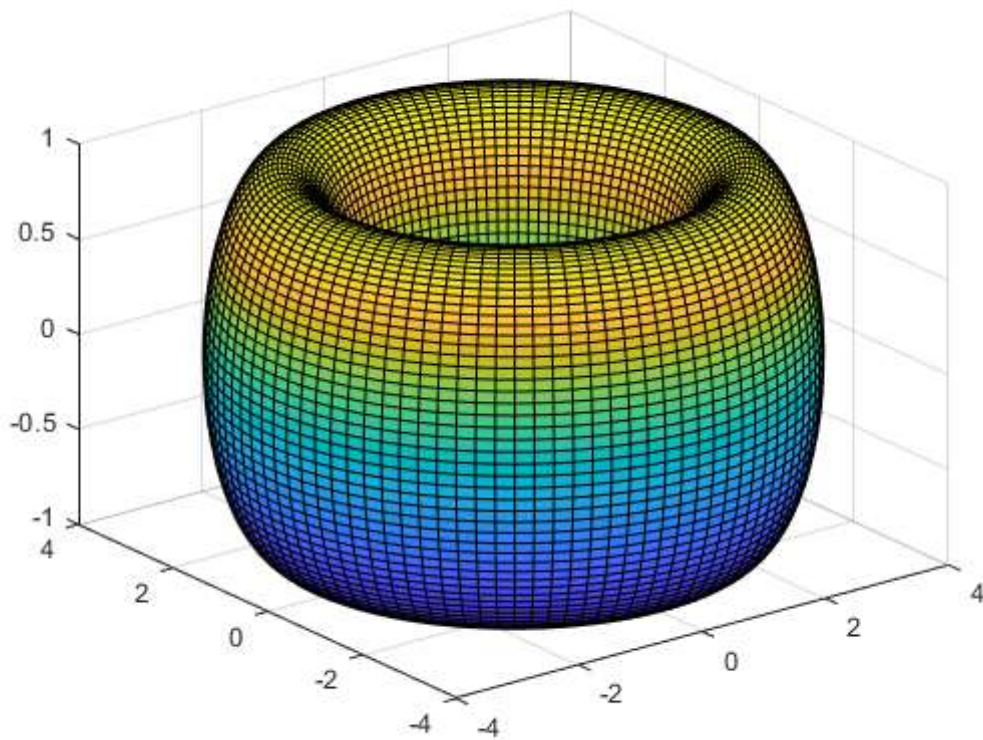
```
... ('phi', 0.1)
    ('a', 1.0)
```

注：我并不知道该函数原来的目的是否是同时分割多个文件夹名称与值，如果是这样，代码仍需修改

## T2

```
R = 3;
r = 1;
angle1 = linspace(0, 2*pi, 100);
angle2 = linspace(0, 2*pi, 100);
[angle1, angle2] = meshgrid(angle1, angle2);
x = (R + r * cos(angle1)) .* cos(angle2);
y = (R + r .* cos(angle1)) .* sin(angle2);
z = r * sin(angle1);
surf(x, y, z)
```

得到图像如下所示:



T3

(1)

---

```
In[3]:= Sum[1 / (n^3 + n^2), {n, 1, Infinity}]
```

```
Out[3]= -1 +  $\frac{\pi^2}{6}$ 
```

(2)

```
In[8]:= Integrate[(Sqrt[x] * Log[x]) / ((x + 1)^2), {x, 0, Infinity}]
```

```
Out[8]=  $\pi$ 
```

# T4

**Q:** Find the solution of the following equation with respect to  $\theta$ :

$$B\cos\theta + B\sin\theta + C = 0$$

**A:**

Let  $x_1 = \cos\theta$  and  $x_2 = \sin\theta$ , then the solution is given by the intersection of

$$x_1^2 + x_2^2 = 1 \quad \text{and} \quad A\cos\theta + B\sin\theta + C = 0$$

We reformulate the equations in a parametric form:

$$|x|^2 = 1 \quad \text{and} \quad x(t) = a + tb$$

where  $x = (x_1, x_2)$ ,  $a = (0, -C/B)$ ,  $b = (-C/A, C/B)$ , and  $t$  is a parameter. The following equation:

$$|a + tb|^2 = 1$$

which can be solved for  $t$  to find the intersection points:

$$t_{1,2} = \frac{-a \cdot b \pm \sqrt{(a \cdot b)^2 - |b|^2(|a|^2 - 1)}}{|b|^2}$$

效果如下图所示，PDF文件一并附在提交文件中

$Q$  : Find the solution of the following equation with respect to  $\theta$ :

$$B\cos\theta + B\sin\theta + C = 0$$

$A$  :

let  $x_1 = \cos\theta$  and  $x_2 = \sin\theta$ , then the solution is given by the intersection of the circle and the line:

$$x_1^2 + x_2^2 = 1$$

$$A\cos\theta + B\sin\theta + C = 0$$

We reformulate the equations in a parametric form:

$$|x|^2 = 1$$

$$x(t) = a + tb$$

where  $x = (x_1, x_2)$ ,  $a = (0, -C/B)$ ,  $b = (-C/A, C/B)$ , and  $t$  is a parameter. The intersection points satisfy the following equation:

$$|a + tb|^2 = 1$$

which can be solved for  $t$  to find the intersection points:

$$t_{1,2} = \frac{-a \cdot b \pm \sqrt{(a \cdot b)^2 - |b|^2(|a|^2 - 1)}}{|b|^2}$$

由于Markdown无法更改字体，故字体与题设不同，望谅解。