part2

1.1 功能描述：

`find_name_value` 函数将一个包含变量名称和数值的目录名（字符串）解析为一个 `(name, value)` 的元组。这个函数能够识别数值是否为负，并相应地处理数值的符号。

输入：

- **folder_name**（字符串）：表示数据目录名称，格式为 `<name><value>`，其中：
  - `<name>` 是字母和数字的组合，表示变量名。
  - `<value>` 是与变量名相关联的数值。如果数值为负，格式会在数值后面加上字母 `'n'`，表示负数值。

输出：

- 返回一个元组 `(name, value)`，其中：
  - `name` 是字符串，表示变量的名称。
  - `value` 是浮动类型，表示与该名称相关联的数值。如果目录名包含 `n`，则表示该数值为负数。

说明：

- 数值部分可以是整数或浮动数字。
- 如果目录名中的数值带有 `'n'`，表示该数值是负的。

用途：

该函数适用于解析某些数据目录名称，自动提取并转换名称和数值部分，方便进一步的数据处理。

1.2 修复

测试代码

```
def test_find_name_value():
    test_cases = [
        ('phi321_0.1', ('phi321_', 0.1)), # name含数字
        ('xNda14.2', ('xNda', 14.2)), # 正常输入
        ('0.12kappa0.5n', ('0.12kappa', -0.5)), # name含数字
        ('zeta0', ('zeta', 0.0)), # 边界：值为0
        ('a123a4.0n5', ('a123a4.0n', 5.0)), # name含数字
        ('phi-0.1', ('phi-', 0.1)), # 边界：负数
        ('xN-14.2n', ('xN-', -14.2)), # 边界：负数
        ('0.1', (None, 0.1)), # 异常：无name
        ('123n', (None, -123.0)), # 异常：无name
        ('kappa', ('kappa', None)), # 异常：无value
    ]

    for folder_name, expected in test_cases:
        try:
```

```
            result = find_name_value(folder_name)
            assert result == expected, f"Test failed for {folder_name}. Expected {ex
            print(f"Test passed for {folder_name}. Result: {result}")
        except Exception as e:
            print(e)

test_find_name_value()
```

原始代码运行结果

```
PS C:\Users\weilan> python -u "c:\Users\weilan\Desktop\1.py"
Test failed for phi321_0.1. Expected ('phi321_', 0.1), but got ('phi', 321.0)
Test passed for xNda14.2. Result: ('xNda', 14.2)
Test failed for 0.12kappa0.5n. Expected ('0.12kappa', -0.5), but got ('', 0.12)
Test passed for zeta0. Result: ('zeta', 0.0)
Test failed for a123a4.0n5. Expected ('a123a4.0n', 5.0), but got ('a', 123.0)
Test failed for phi-0.1. Expected ('phi-', 0.1), but got ('phi', -0.1)
could not convert string to float: '--14.2'
Test failed for 0.1. Expected (None, 0.1), but got ('', 0.1)
Test failed for 123n. Expected (None, -123.0), but got ('', -123.0)
Test passed for kappa. Result: ('kappa', None)
```

可以看到需要修改的部分包括:

- 对下划线的处理
- name中含有数字的情况
- 正负由于由末尾的n来表示所以正负号应被视为包含在name中
- name为空的情况

修改后函数

```
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
            phi-0.1n        # should return 'phi', -0.1
```

```
    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 = r'(\d*\.\d+|\d+)(n?)$'
    match = re.search(pattern, folder_name)
    if not match:
        return folder_name, None

    value_str, sign_str = match.groups()
    name = folder_name[:match.start()]

    if sign_str == 'n':
        value = '-' + value_str
        else:
            value = value_str

    if not name:
        name = None

    return name, float(value)
```

- 修改后测试结果：

```
PS C:\Users\weilan> python -u "c:\Users\weilan\Desktop\1.py"
Test passed for phi321_0.1. Result: ('phi321_', 0.1)
Test passed for xNda14.2. Result: ('xNda', 14.2)
Test passed for 0.12kappa0.5n. Result: ('0.12kappa', -0.5)
Test passed for zeta0. Result: ('zeta', 0.0)
Test passed for a123a4.0n5. Result: ('a123a4.0n', 5.0)
Test passed for phi-0.1. Result: ('phi-', 0.1)
Test passed for xN-14.2n. Result: ('xN-', -14.2)
Test passed for 0.1. Result: (None, 0.1)
Test passed for 123n. Result: (None, -123.0)
Test passed for kappa. Result: ('kappa', None)
```

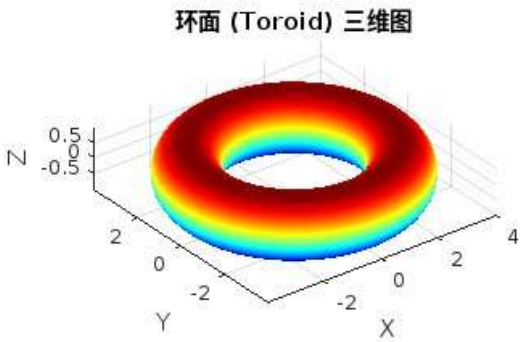
1.3 运行

- “phi0.1_xN14.2_kappa0.5n”：('phi0.1_xN14.2_kappa', -0.5)
- “a1_b14n_n0_c0.2”：('a1_b14n_n0_c', 0.2)

2

```
% 参数设定
R = 3;  % 大半径
r = 1;  % 小半径

% 生成参数网格
theta = linspace(0, 2*pi, 50);  % theta 从 0 到 2*pi
phi = linspace(0, 2*pi, 50);    % phi 从 0 到 2*pi
[Theta, Phi] = meshgrid(theta, phi);  % 创建网格

% 计算 x, y, z 坐标
X = (R + r * cos(Theta)) .* cos(Phi);
Y = (R + r * cos(Theta)) .* sin(Phi);
Z = r * sin(Theta);

% 使用 surf 函数绘制三维图
figure;
surf(X, Y, Z);

% 设置图形属性
shading interp;  % 插值平滑
colormap jet;    % 使用 Jet 配色方案
axis equal;      % 保持轴的比例一致
xlabel('X');
ylabel('Y');
zlabel('Z');
title('环面 (Toroid) 三维图');
```

- 结果



3

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

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

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

$$\text{Out[]}= \pi$$

4

Q: Find the solution of the following equation with respect to θ :

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

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:

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

$$Ax_1 + Bx_2 + C = 0$$

We reformulate the equations in a parametric form:

$$|\mathbf{x}|^2 = 1, \quad \mathbf{x}(t) = \mathbf{a} + t\mathbf{b}$$

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

$$|\mathbf{a} + t\mathbf{b}|^2 = 1$$

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

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