Question 1.

code:

```
temp = np.random.uniform(-2, 2, 95)
test_num = np.append(temp, [-2, -1, 0, 1, 2]) # 构建100个测试数据，其中前95个是-2到2的
小数，后5个是-2，-1，0，1，2
test_decimals = np.random.randint(10, size=100) # 构建了100个整数，取自0到9
for i in range(100):
    s = np.random.randint(10) # 先随机选定一个列表的size
    test_list = [np.random.randint(low=0, high=10, size=s).tolist() for i in
range(100)] # 构建了100个列表
ret = []
for i in range(100):  # 每个参数都有
    ret.append(
        ["函数为
format_number("+str(test_num[i])+","+str(test_decimals[i])+","+str(test_list[i])+
")="+str(format_number(test_num[i], test_decimals[i], test_list[i]))])
for i in range(100):  # 缺少第一个参数
    ret.append(
        ["函数为
format_number("+str(test_num[i])+","+str(test_list[i])+")="+str(format_number(tes
t_num[i], test_decimals[i], test_list[i]))])
for i in range(100):  # 缺少第二个参数
    ret.append(
        ["函数为
format_number("+str(test_num[i])+","+str(test_decimals[i])+str(format_number(test
_num[i], test_decimals[i], test_list[i]))])
for i in range(100):  # 两个参数都没有
    ret.append(
        ["函数为
format_number("+str(test_num[i])+")="+str(format_number(test_num[i],
test_decimals[i], test_list[i]))])
print(ret)
```

ANS:
最终的答案是一个二维列表。

```
[['函数为format_number(-1.2177798824606119,6,[5, 1, 6, 3, 9, 0, 7,
0])=-1.217780']...]
```

Question 2.

code:

```
A = np.array([[1, 0, -3, 0, 5],
              [4, -1, 3, -2, 9],
              [0, 3, 2, -5, 1],
              [0, 0, 1, -4, 7],
              [9, 8, 7, 6, 5]])
b = np.array([1, 2, 3, 4, 5])
x = np.linalg.solve(A, b)
print(x)
```

ANS:

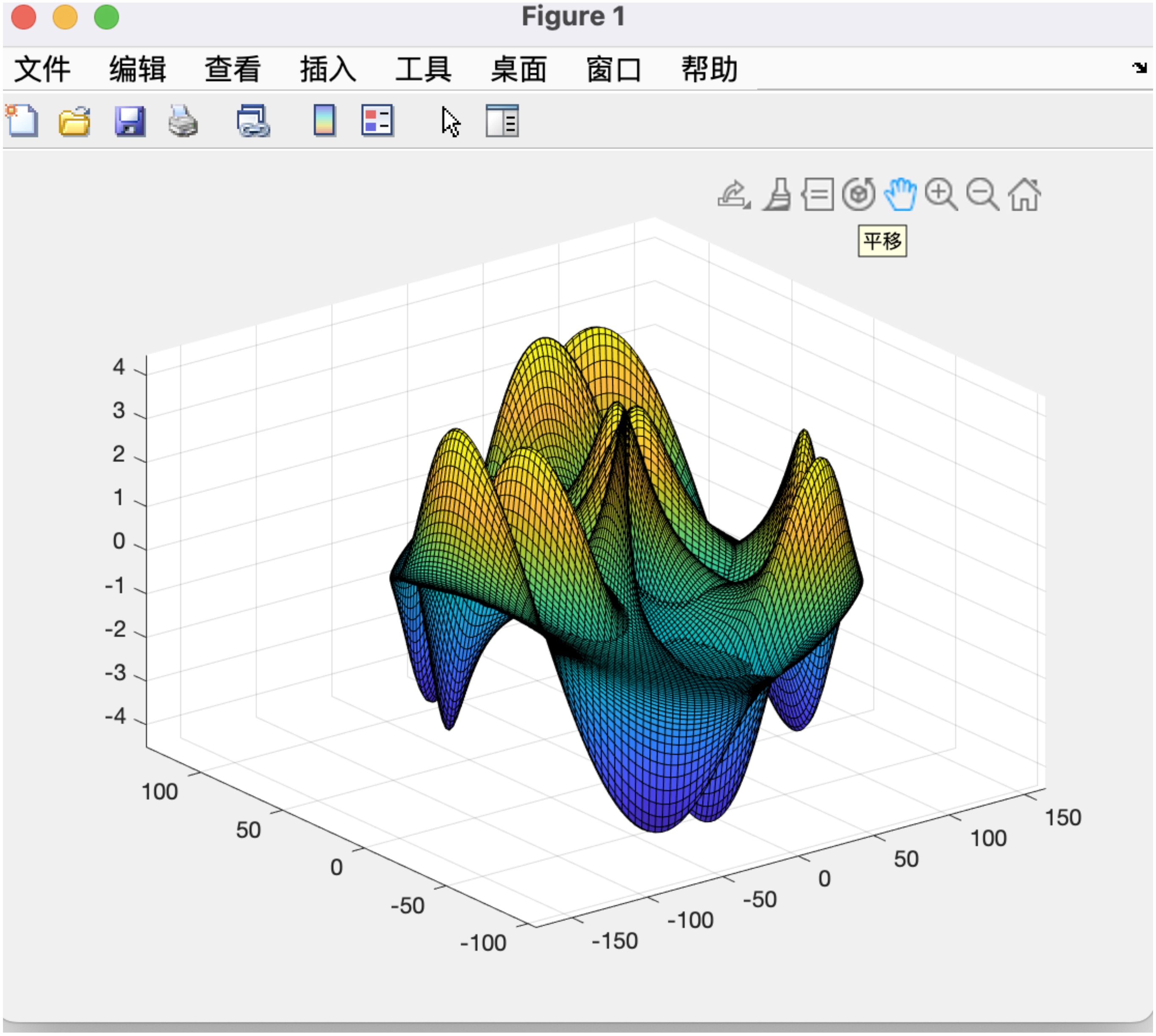
```
[-0.86199095  0.78506787  0.37669683  0.14140271  0.59841629]
```

Question 3.

code:

```
[u,v] = meshgrid(0:pi/100:2*pi);
x = cos(v).*[6-(5/4+sin(3*u))*sin(u-3*v)]
y = sin(v).*[6-(5/4+sin(3*u))*sin(u-3*v)]
z = -cos(u-(3*v))./(5/4+sin(3*u))
surf(x, y, z);
```

ANS:



Question 4.

ANS:

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

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

```
In[2]:= Sum[1/n^4, {n, 1, Infinity}]
```

Out[2]= $\frac{\pi^4}{90}$

```
In[3]:= Sum[1/n^6, {n, 1, Infinity}]
```

Out[3]= $\frac{\pi^6}{945}$

```
In[4]:= Sum[1/n^8, {n, 1, Infinity}]
```

Out[4]= $\frac{\pi^8}{9\,450}$

```
In[5]:= Sum[1/n^10, {n, 1, Infinity}]
```

Out[5]= $\frac{\pi^{10}}{93\,555}$

Question 5.

ANS:

The **Riemann zeta function** or **Euler–Riemann zeta function**, denoted by the Greek letter ζ (zeta), is a mathematical function of a complex variable $s = \sigma + it$defined as

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} = \frac{1}{1^s} + \frac{1}{2^s} + \frac{1}{3^s} + \cdots$$

for $\mathrm{Re}(s) > 1$and its analytic continuation elsewhere. When $\mathrm{Re}(s) = \sigma > 1$, the function can be written as a converging summation or integral:

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} = \frac{1}{\Gamma(s)} \int_0^{\infty} \frac{x^{s-1}}{e^x - 1} \mathrm{dx}$$

where

$$\Gamma(s)=\int_0^\infty x^{s-1}e^{-x}\mathrm{dx}$$

is the gamma function.

In 1737, the connection between the zeta function and prime numbers was discovered by Euler, who proved the identity

$$\sum_{n=1}^\infty \frac{1}{n^s}=\prod_{p\ prime}\frac{1}{1-p^{-s}},$$

where, by definition, the left hand side is $\zeta(s)$ and the infinite product on the right hand side extends over all prime numbers (such expressions are called Euler products):

$$\prod_{p\ prime}\frac{1}{1-p^{-s}}=\frac{1}{1-2^{-s}}\cdot\frac{1}{1-3^{-s}}\cdot\frac{1}{1-5^{-s}}\cdot\frac{1}{1-7^{-s}}\cdot\frac{1}{1-11^{-s}}\cdots\frac{1}{1-p^{-s}}\cdots$$

Both sides of the Euler product formula converge for $\mathrm{Re}(s)>1$