1 Numpy

In [1]:

```
def func(x):
    return x**2+2*x+3
```

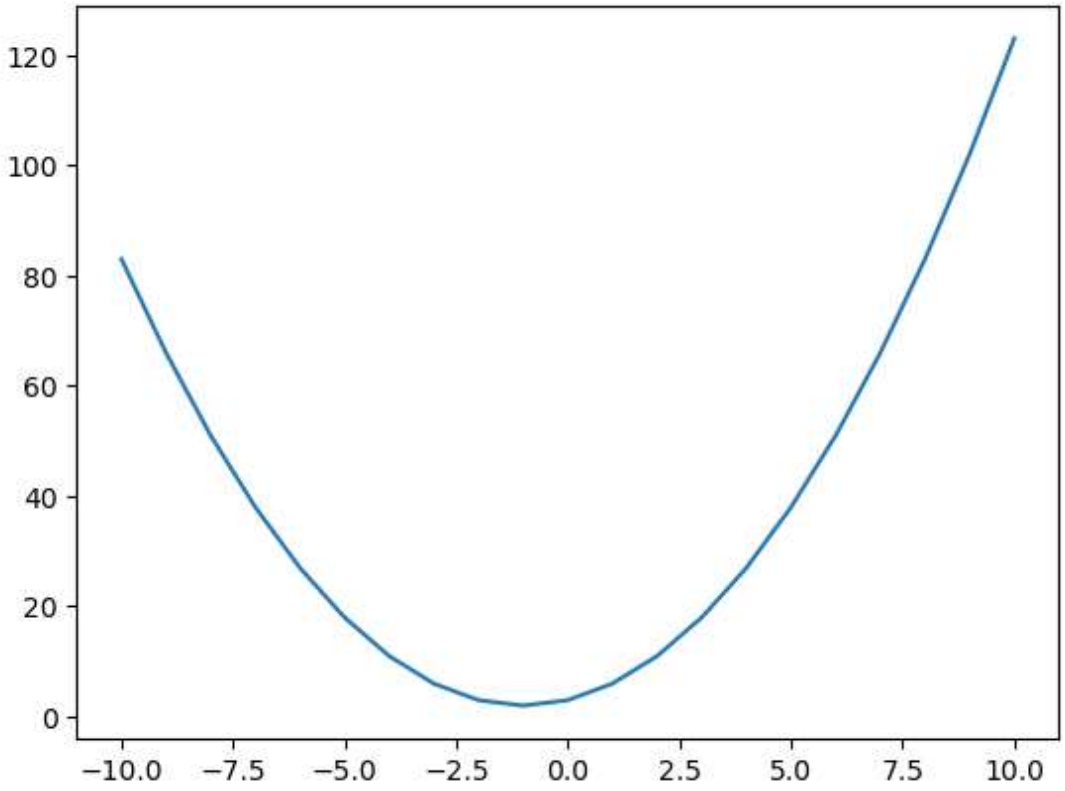
executed in 10ms, finished 18:04:33 2023-09-26

In [2]:

```
import matplotlib.pyplot as plt
xlist = range(-10,11)
ylist = [func(x) for x in xlist]
plt.plot(xlist,ylist)
```

executed in 2.08s, finished 18:05:34 2023-09-26

Out[2]: [<matplotlib.lines.Line2D at 0x1df585416d0>]

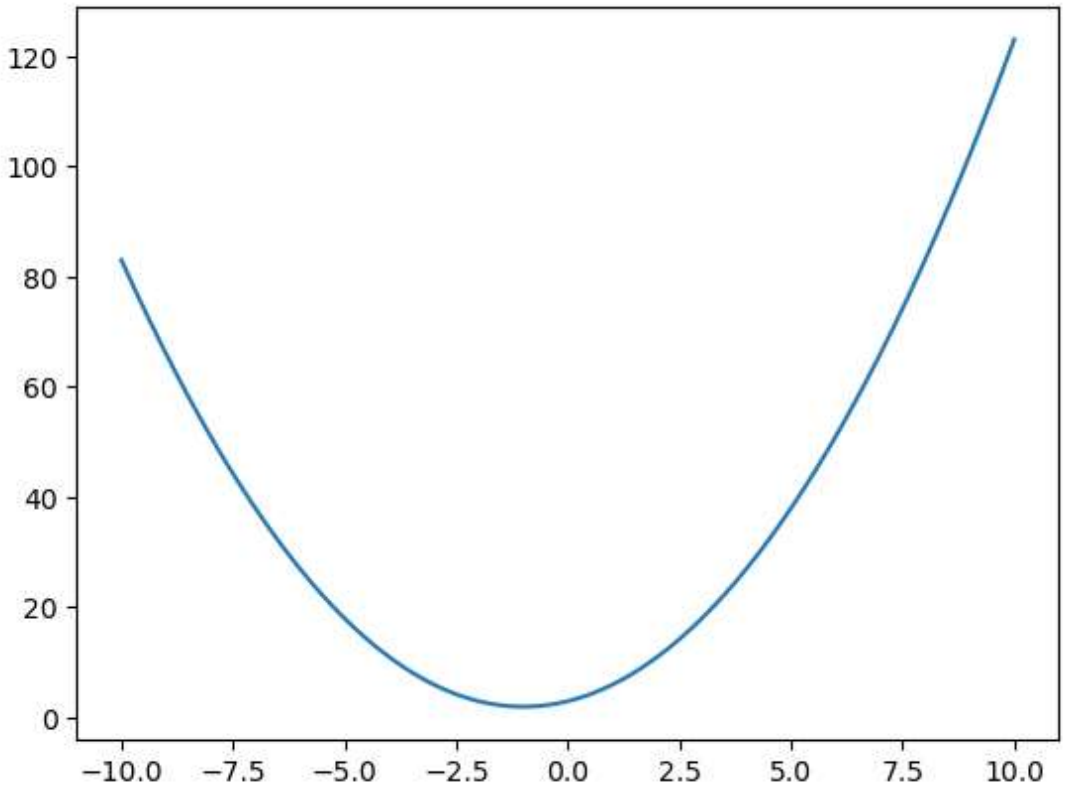


In [6]:

```
1 xlist = [-10+i/100 for i in range(0,2001)]
2 ylist = [func(x) for x in xlist]
3 plt.plot(xlist,ylist)
```

executed in 451ms, finished 18:10:34 2023-09-26

Out[6]: [<matplotlib.lines.Line2D at 0x1df5862bb80>]



In [8]:

```
1 import numpy as np
```

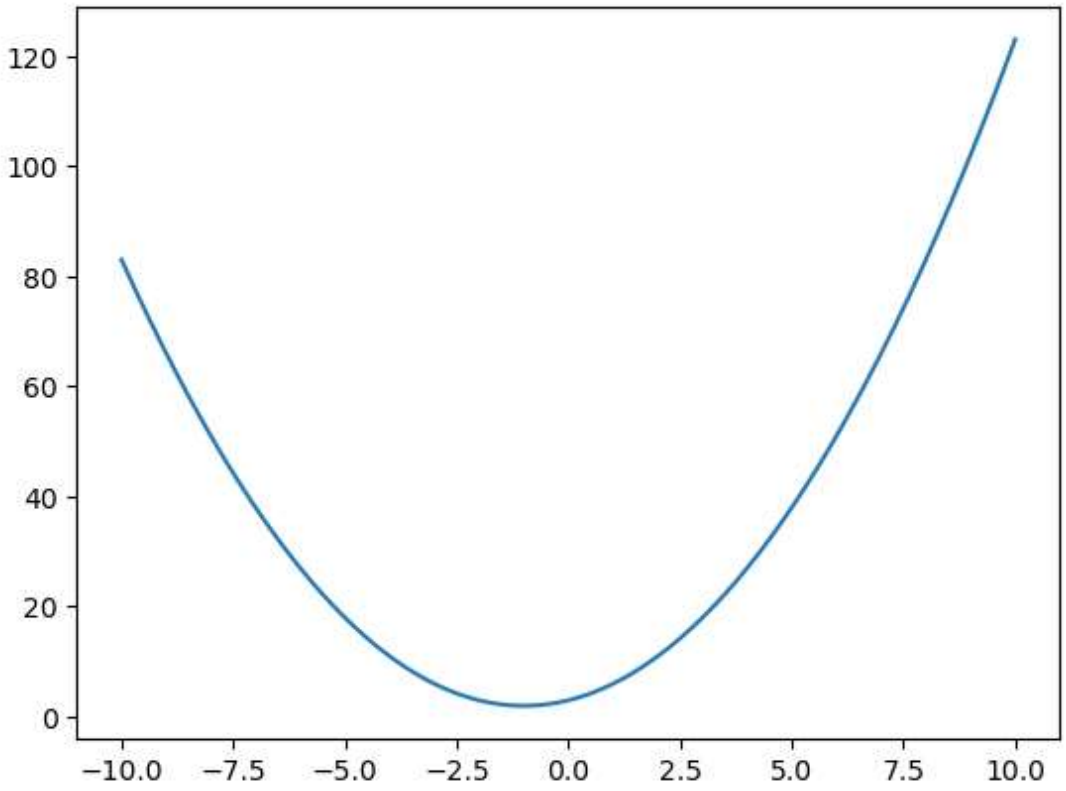
executed in 19ms, finished 18:11:16 2023-09-26

In [12]:

```
1 xarray = np.linspace(-10, 10, 1000)
2 yarray = func(xarray)
3 plt.plot(xarray, yarray)
```

executed in 433ms, finished 18:14:07 2023-09-26

Out[12]: [<matplotlib.lines.Line2D at 0x1df57dbe3a0>]



In [11]:

```
1
```

executed in 40ms, finished 18:13:34 2023-09-26

```
26.95997599,  26.76033691,  26.56149944,  26.36346356,
26.16622929,  25.96979662,  25.77416556,  25.57933609,
25.38530823,  25.19208197,  24.99965731,  24.80803426,
24.61721281,  24.42719296,  24.23797471,  24.04955807,
23.86194302,  23.67512958,  23.48911775,  23.30390751,
23.11949888,  22.93589185,  22.75308642,  22.57108259,
22.38988037,  22.20947975,  22.02988073,  21.85108332,
21.6730875 ,  21.49589329,  21.31950068,  21.14390968,
20.96912027,  20.79513247,  20.62194627,  20.44956167,
20.27797868,  20.10719729,  19.9372175 ,  19.76803931,
19.59966273,  19.43208774,  19.26531436,  19.09934259,
18.93417241,  18.76980384,  18.60623687,  18.4434715 ,
18.28150773,  18.12034557,  17.95998501,  17.80042605,
17.6416687 ,  17.48371294,  17.32655879,  17.17020624,
17.0146553 ,  16.85990595,  16.70595821,  16.55281207,
16.40046753,  16.2489246 ,  16.09818327,  15.94824354,
15.79910541,  15.65076889,  15.50323396,  15.35650064,
15.21056893,  15.06543881,  14.9211103 ,  14.77758339,
14.63485808,  14.49293438,  14.35181227,  14.21149177,
14.07197287,  13.93325558,  13.79533988,  13.65822579,
```

In [13]:
```
1 np.sqrt(20)
```
executed in 24ms, finished 18:16:26 2023-09-26

Out[13]: 4.47213595499958

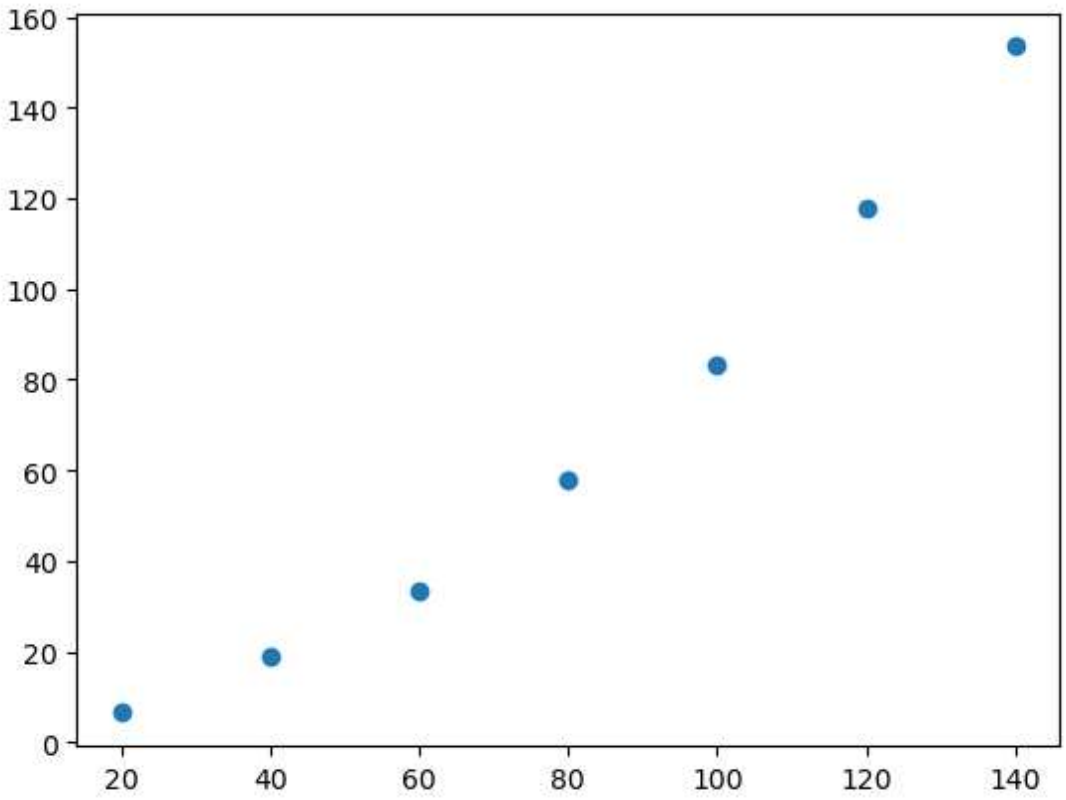
In [14]:
```
1 np.sqrt([2,3,4,5])
```
executed in 21ms, finished 18:16:40 2023-09-26

Out[14]: array([1.41421356, 1.73205081, 2. , 2.23606798])

2 刹车距离

In [15]:
```
1 dlist = [20,40,60,80,100,120,140]
2 slist = [6.5,18.8,33.6,58.1,83.4,118,153.5]
3 plt.scatter(dlist,slist)
```
executed in 455ms, finished 18:26:20 2023-09-26

Out[15]: <matplotlib.collections.PathCollection at 0x1df5a03b340>



In [16]:
```
1 from scipy.optimize import curve_fit
```
executed in 16ms, finished 18:33:03 2023-09-26

In [18]:

```
dlist = [20, 40, 60, 80, 100, 120, 140]
slist = [6.5, 18.8, 33.6, 58.1, 83.4, 118, 153.5]
def linear_func(x, a, b):
    y = a*x+b
    return y
(a, b), cov = curve_fit(linear_func, dlist, slist)
```

executed in 21ms, finished 18:36:00 2023-09-26

In [19]:

```
a, b
```

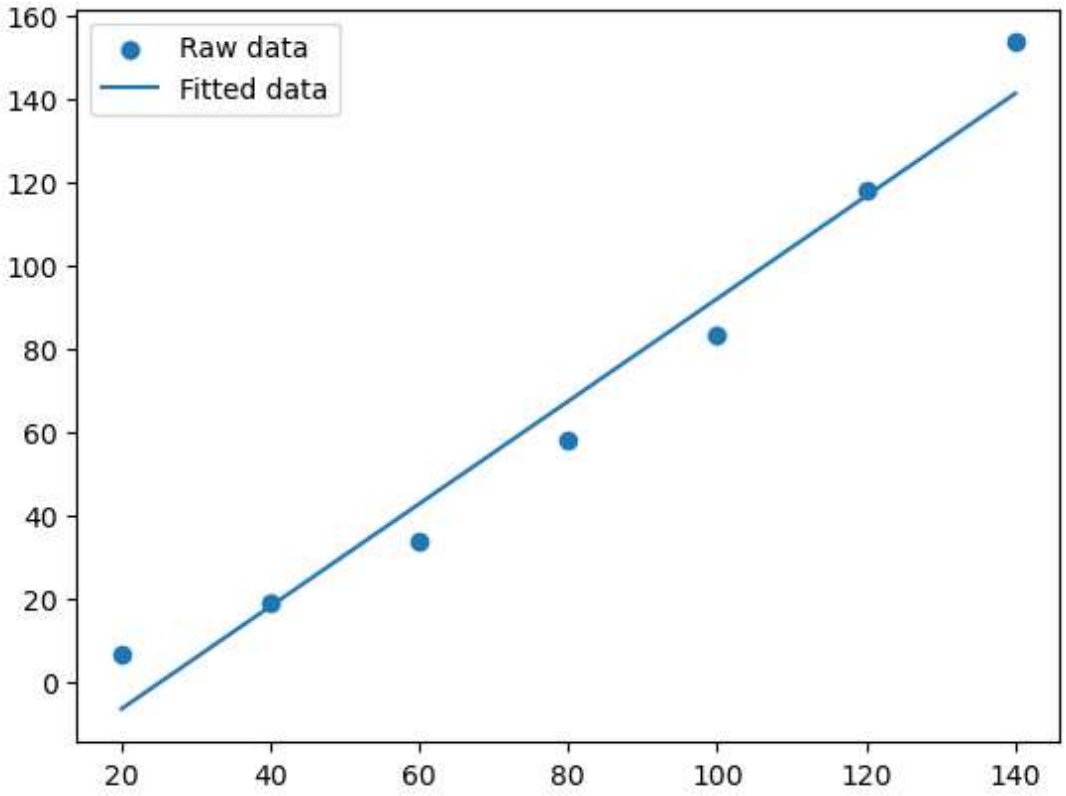
executed in 12ms, finished 18:36:33 2023-09-26

Out[19]: (1.230714285714789, -31.042857142927033)

In [20]:

```
spred = [linear_func(d, a, b) for d in dlist]
plt.scatter(dlist, slist, label='Raw data')
plt.plot(dlist, spred, label='Fitted data')
plt.legend()
plt.show()
```

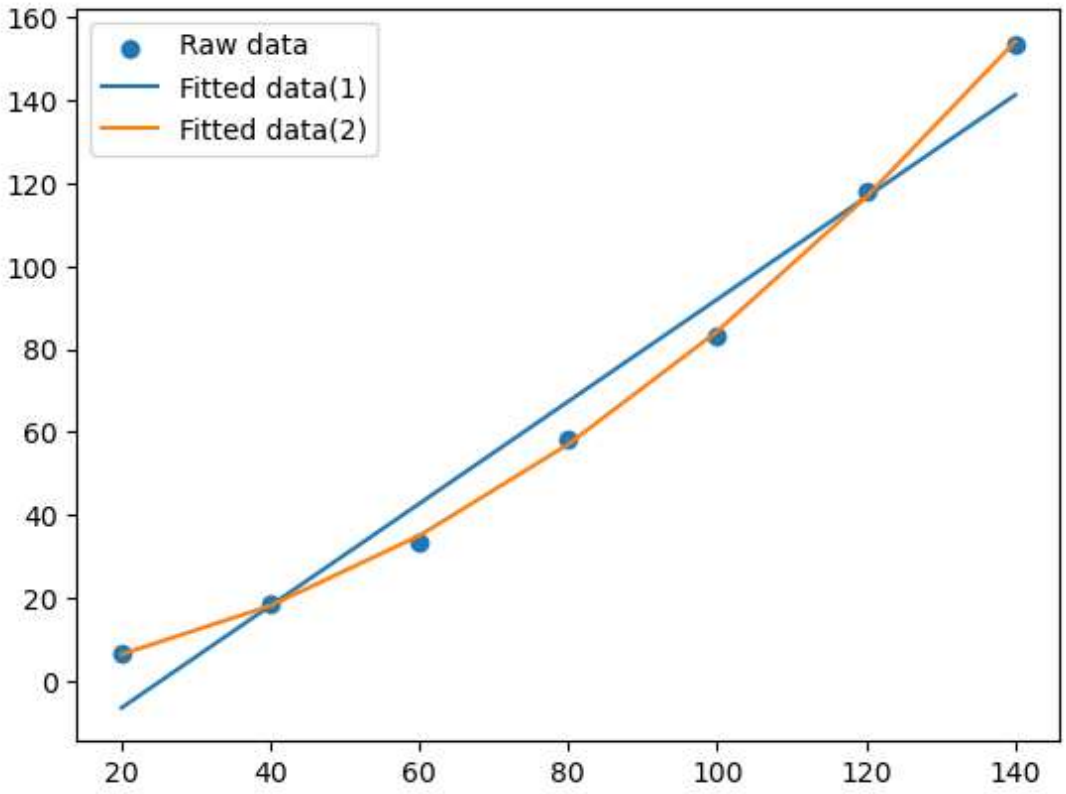
executed in 460ms, finished 18:38:32 2023-09-26



In [23]:

```
dlist = [20, 40, 60, 80, 100, 120, 140]
slist = [6.5, 18.8, 33.6, 58.1, 83.4, 118, 153.5]
def quad_func(x, a2, b2, c2):
    y = a2*x**2+b2*x+c2
    return y
(a2, b2, c2), cov = curve_fit(quad_func, dlist, slist)
spred2 = [quad_func(d, a2, b2, c2) for d in dlist]
plt.scatter(dlist, slist, label='Raw data')
plt.plot(dlist, spred, label='Fitted data(1)')
plt.plot(dlist, spred2, label='Fitted data(2)')
plt.legend()
plt.show()
```

executed in 474ms, finished 18:44:55 2023-09-26

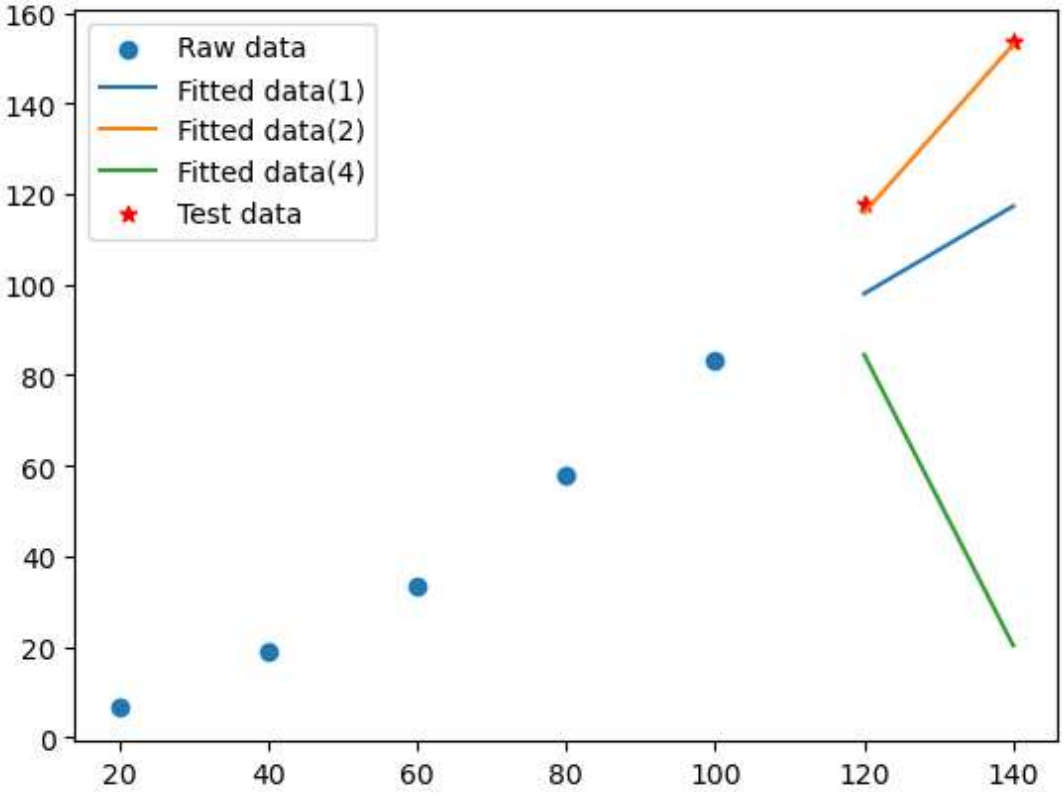


In [35]:

```
dlist = [20,40,60,80,100]
slist = [6.5,18.8,33.6,58.1,83.4]

dlist_test = [120,140]
slist_test = [118,153.5]

def linear_func(x,a,b):
    y = a*x+b
    return y
(a,b),cov = curve_fit(linear_func,dlist,slist)
spred = [linear_func(d,a,b) for d in dlist_test]

def quad_func(x,a2,b2,c2):
    y = a2*x**2+b2*x+c2
    return y
(a2,b2,c2),cov = curve_fit(quad_func,dlist,slist)
spred2 = [quad_func(d,a2,b2,c2) for d in dlist_test]

def four_func(x,a4,b4,c4,d4,e4):
    y = a4*x**4+b4*x**3+c4*x**2+d4*x+e4
    return y
(a4,b4,c4,d4,e4),cov = curve_fit(four_func,dlist,slist)
spred4 = [four_func(d,a4,b4,c4,d4,e4) for d in dlist_test]


plt.scatter(dlist,slist,label='Raw data')
plt.plot(dlist_test,spred,label='Fitted data(1)')
plt.plot(dlist_test,spred2,label='Fitted data(2)')
plt.plot(dlist_test,spred4,label='Fitted data(4)')
plt.scatter(dlist_test,slist_test,marker='*',color='red',label='Test data'
plt.legend()
plt.show()
```

executed in 569ms, finished 19:24:03 2023-09-26

```
D:\softwares\anaconda3\lib\site-packages\scipy\optimize\_minpack_py.py:1010:
OptimizeWarning: Covariance of the parameters could not be estimated
  warnings.warn('Covariance of the parameters could not be estimated',
```

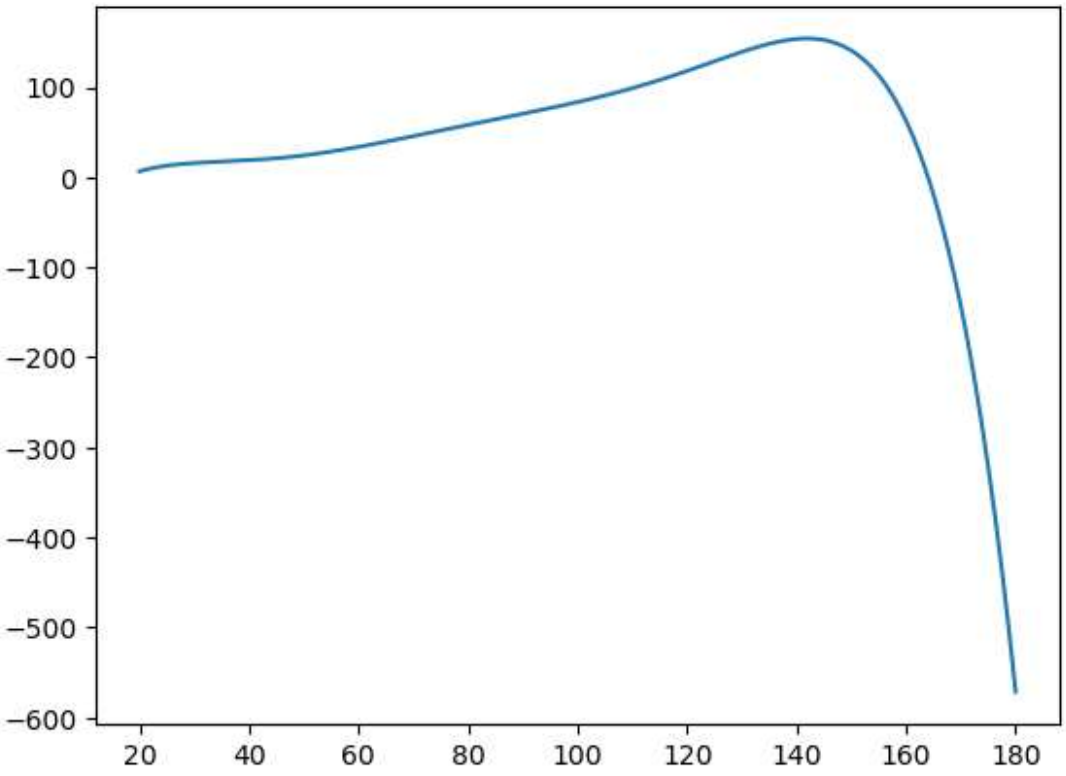


In [28]:

```
1 xarray6 = np.linspace(20, 180, 1000)
2 yarray6 = six_func(xarray6, a6, b6, c6, d6, e6, f6, g6)
3 plt.plot(xarray6, yarray6)
```

executed in 451ms, finished 19:11:26 2023-09-26

Out[28]: [<matplotlib.lines.Line2D at 0x1df5dcf9850>]



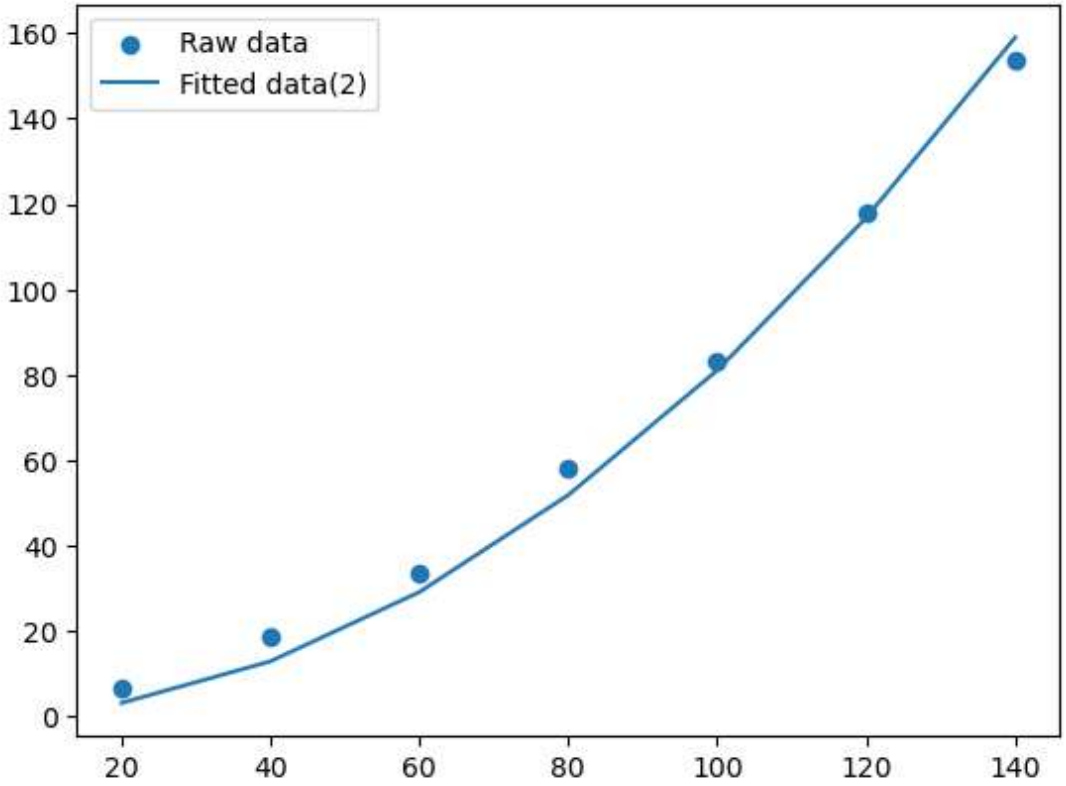
In [ ]:

```
dlist = [20, 40, 60, 80, 100, 120, 140]
slist = [6.5, 18.8, 33.6, 58.1, 83.4, 118, 153.5]
def six_func(x, a6, b6, c6, d6, e6, f6, g6):
    y = a6*x**6+b6*x**5+c6*x**4+d6*x**3+e6*x**2+f6*x+g6
    return y
(a6, b6, c6, d6, e6, f6, g6), cov = curve_fit(six_func, dlist, slist)
spred6 = [six_func(d, a6, b6, c6, d6, e6, f6, g6) for d in dlist]
plt.scatter(dlist, slist, label='Raw data')
plt.plot(dlist, spred, label='Fitted data(1)')
plt.plot(dlist, spred2, label='Fitted data(2)')
plt.plot(dlist, spred6, label='Fitted data(6)')
plt.legend()
plt.show()
```

In [38]:

```
dlist = [20, 40, 60, 80, 100, 120, 140]
slist = [6.5, 18.8, 33.6, 58.1, 83.4, 118, 153.5]
def quad2_func(x, a):
    y = x**2/(2*a)
    return y
(a), cov = curve_fit(quad2_func, dlist, slist)
spred2 = [quad2_func(d, a) for d in dlist]
plt.scatter(dlist, slist, label='Raw data')
plt.plot(dlist, spred2, label='Fitted data(2)')
plt.legend()
plt.show()
```

executed in 488ms, finished 19:51:58 2023-09-26



In [39]:

```
a
```

executed in 23ms, finished 19:52:37 2023-09-26

Out[39]: array([61.65530517])

In [ ]:

```
1
```