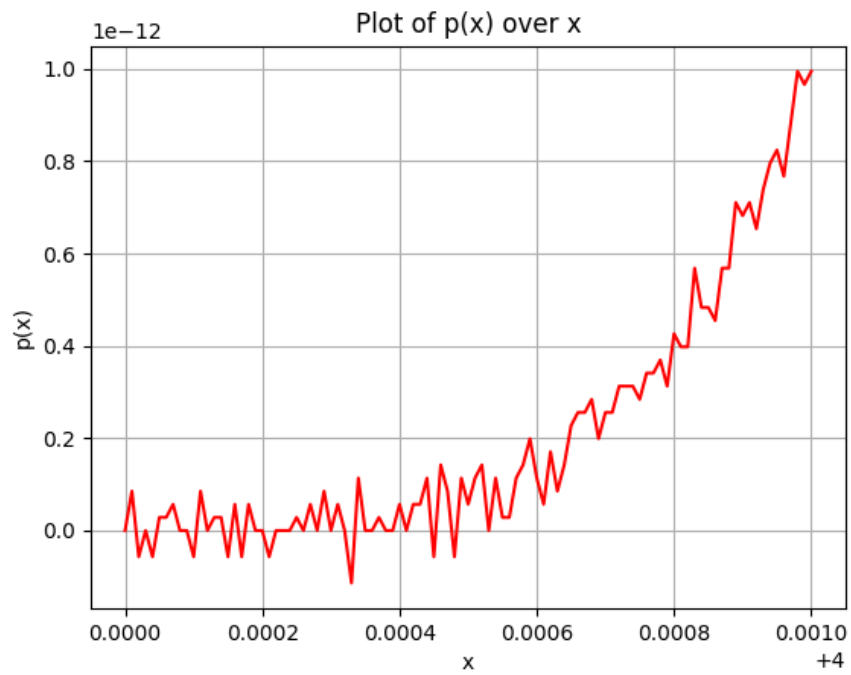
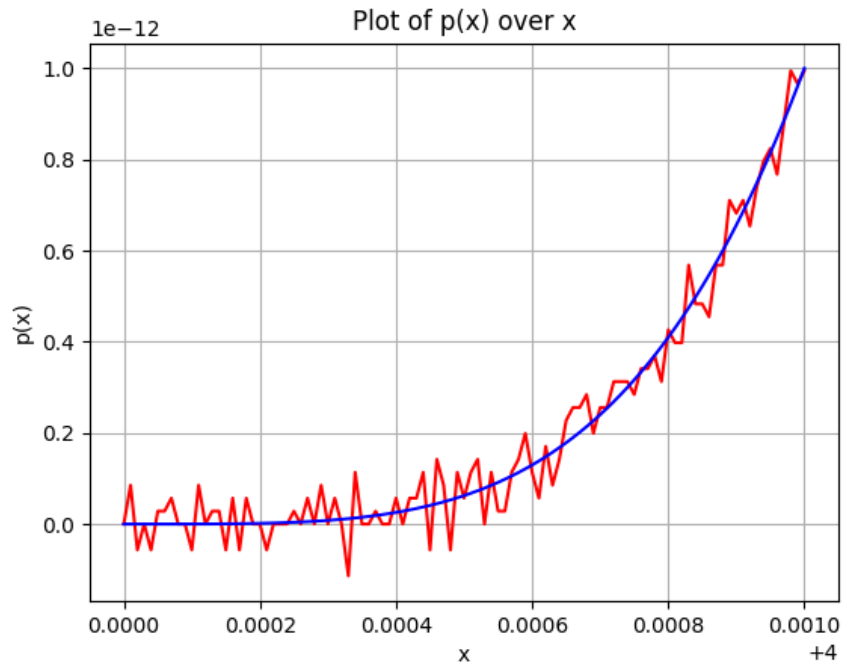


Problem 1

a)



b)



- ☐ The red line represents the polynomial function. The blue line represents the x^4

c)

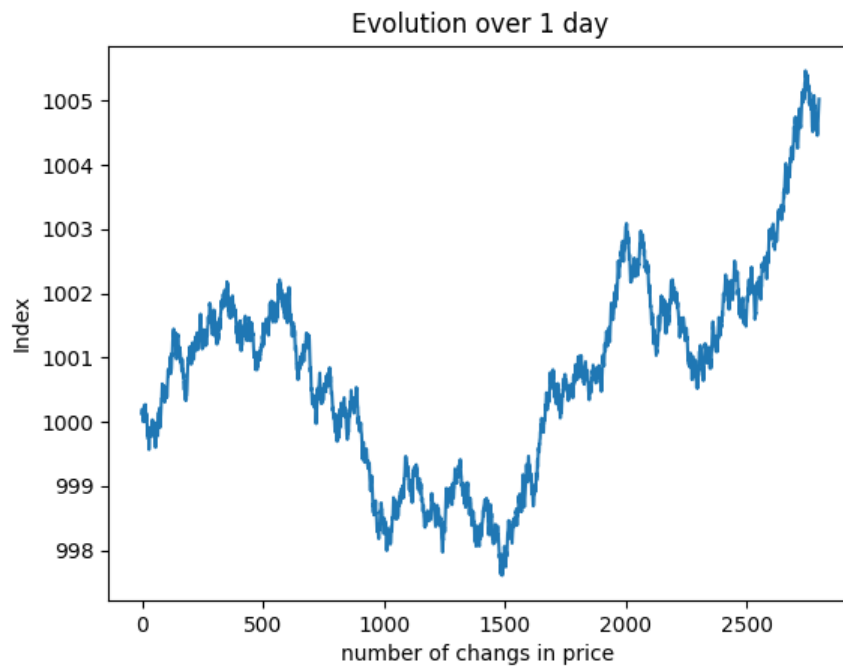
- Two curves deviate from each other. When using the expression $(x-4)^4$, the floating-point operations involve numbers of similar order of magnitude. When using the polynomial coefficients, the floating-point operations involve numbers that vary greatly in size due to the coefficients -16, 96, -256 and 256. The polynomial expression hence leads to accumulation of rounding errors and precision loss during the computation.

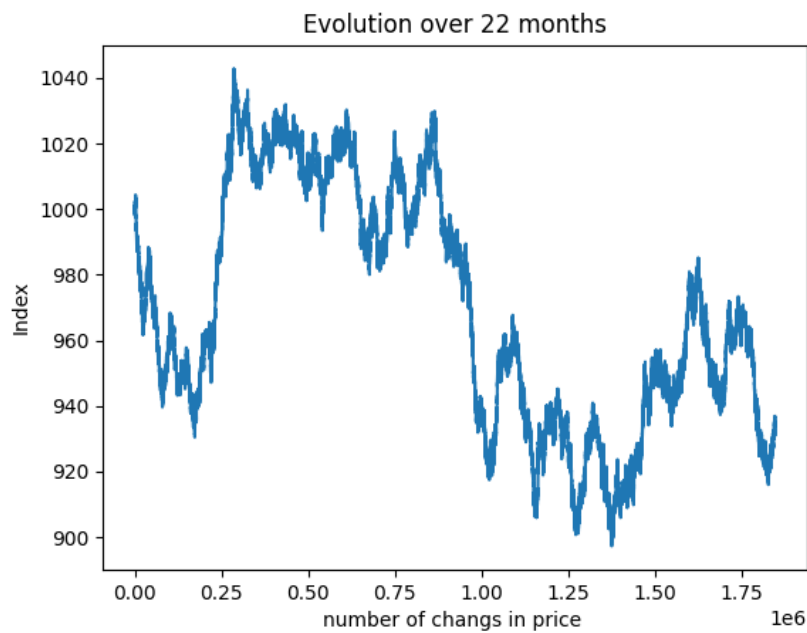
Problem 2

a)

```
def truncate (x):  
    '''  
    truncate the number after the third decimal place  
    '''  
    return int(x * 1000) / 1000
```

b)





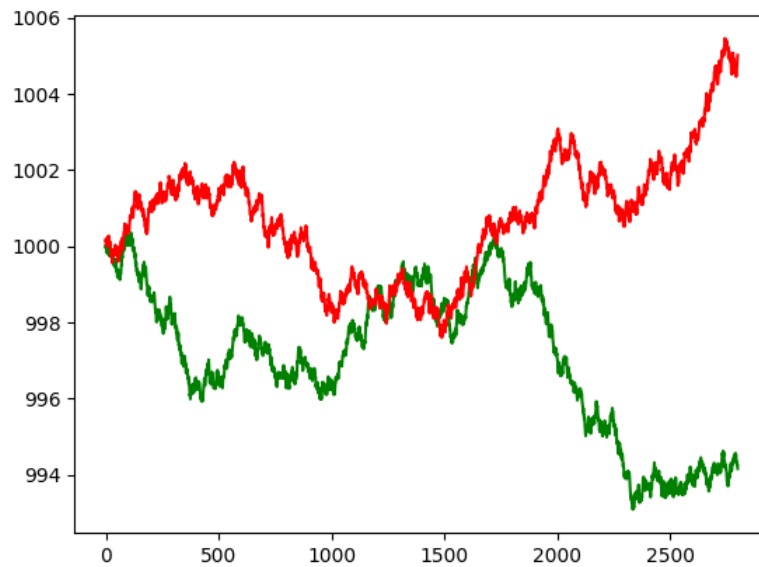
- The change in the index is different and becomes more volatile with the time.

c)

```
how many points on average would you drop for one day: 0.0004937949227543267  
how many points on average would you drop for 22 months: 0.0005007510496536499  
(base) qingkehong@qingkehongdeMacBook-Pro hw2 % /usr/local/bin/python3 "/Users/q  
ingkehong/Desktop/math122 big data/hw2/problem2.py"
```

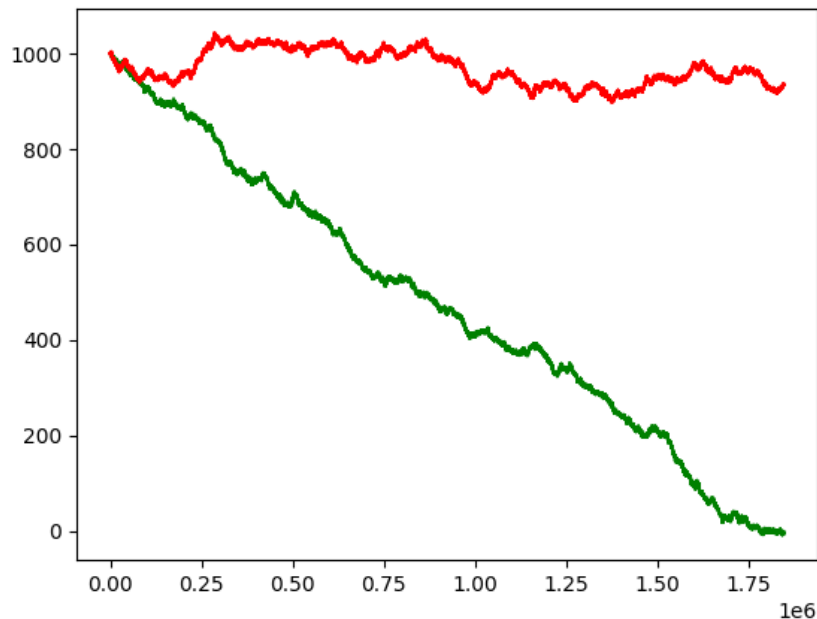
d)

```
def index2 (m):  
    '''  
    define a new truncated index function  
    '''  
    index_list = []  
    old_index = 1000  
    for _ in range (m):  
        price_change = random.uniform(-200 , 200)  
        new_index = old_index + price_change * 100/baseline_sum  
        truncate_index = int(new_index*1000)/1000  
        index_list.append(truncate_index)  
        old_index = truncate_index  
    return index_list  
#truncated evolution over 1 day  
one_day2 = index2(num1)  
plt.plot(one_day2,'g') #truncated  
plt.plot(one_day1,'r') #raw  
plt.show()
```



- ☐ The red line represents the truncated index under one day. The green line represents the untruncated index under one day.

```
#truncated evolution over 22month
month2 = index2(num2)
plt.plot(month2,'g') #truncated
plt.plot(month1,'r') #raw
plt.show()
```



- ☐ The green line represents the truncated index. The red line represents the untruncated index under 22months.

e)

- ☐ As the initial index was 1000, the market should experience a bear market if the actual index stood at 524.881. Well, the truncated mechanism is accumulating rounding-off errors. As more stock price changes occur and the index is continuously updated, the roundoff errors accumulates. Consequently, the truncated index value drifts away from the true index value, affecting the accuracy of the index.