

```
In [1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

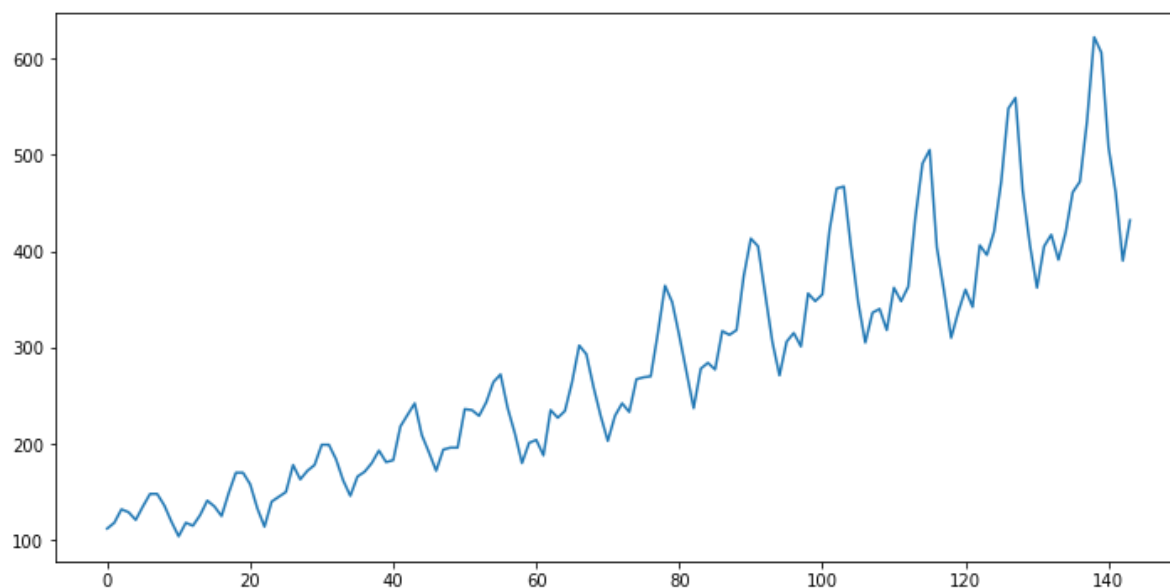
```
In [4]: df = pd.read_csv("AirPassengers - AirPassengers.csv")
df.head()
```

Out[4]:

	Month	#Passengers
0	1949-01	112
1	1949-02	118
2	1949-03	132
3	1949-04	129
4	1949-05	121

```
In [6]: plt.rcParams.update({'figure.figsize':(12,6)})
df['#Passengers'].plot()
```

Out[6]: <AxesSubplot:>



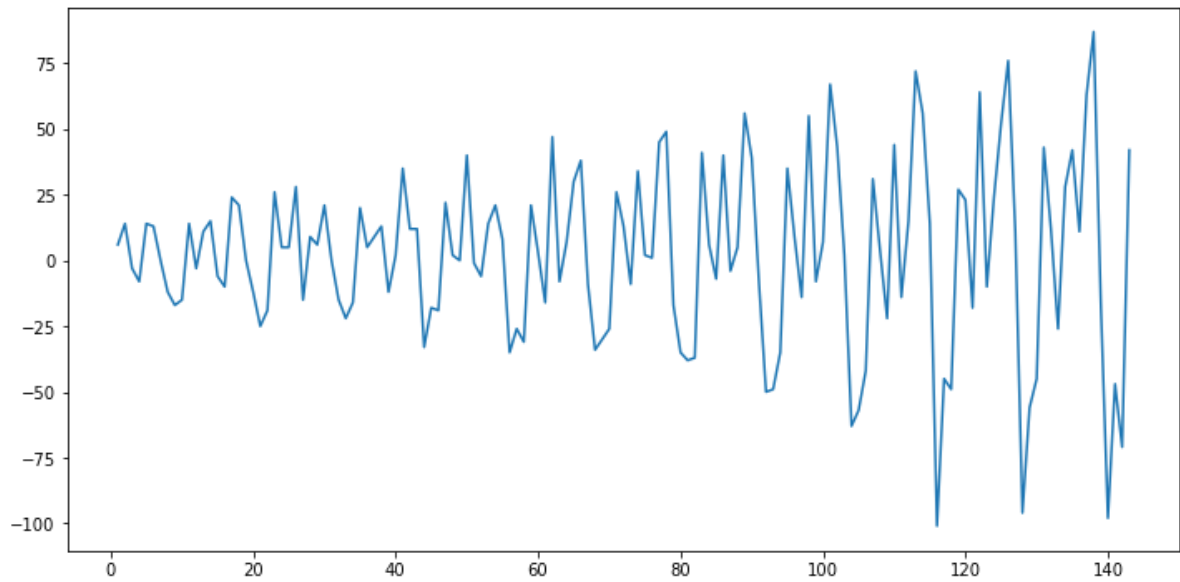
Method1 - Differencing and Seasonal differencing

```
In [7]: #differencing meaning  $y(t) = y(t)-y(t-1)$ 
```

```
In [9]: df['#Passengers_diff'] = df['#Passengers'] - df['#Passengers'].shift(1)
```

```
In [11]: df['#Passengers_diff'].dropna().plot()
```

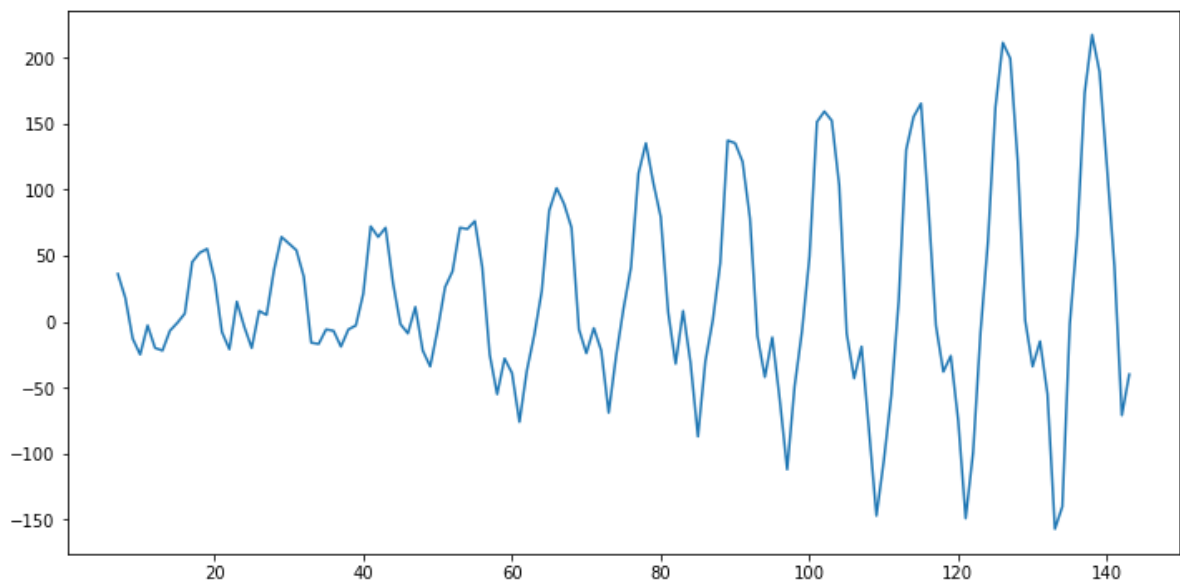
```
Out[11]: <AxesSubplot:>
```



```
In [15]: #Seasonal differencing meaning -  $y(t) = y(t) - y(t-n)$ 
```

```
In [16]: df['#Passengers_diff'] = df['#Passengers'] - df['#Passengers'].shift(7)
df['#Passengers_diff'].dropna().plot()
```

```
Out[16]: <AxesSubplot:>
```



Method 2 - Transformation

```
In [18]: #create transformation columns
import numpy as np

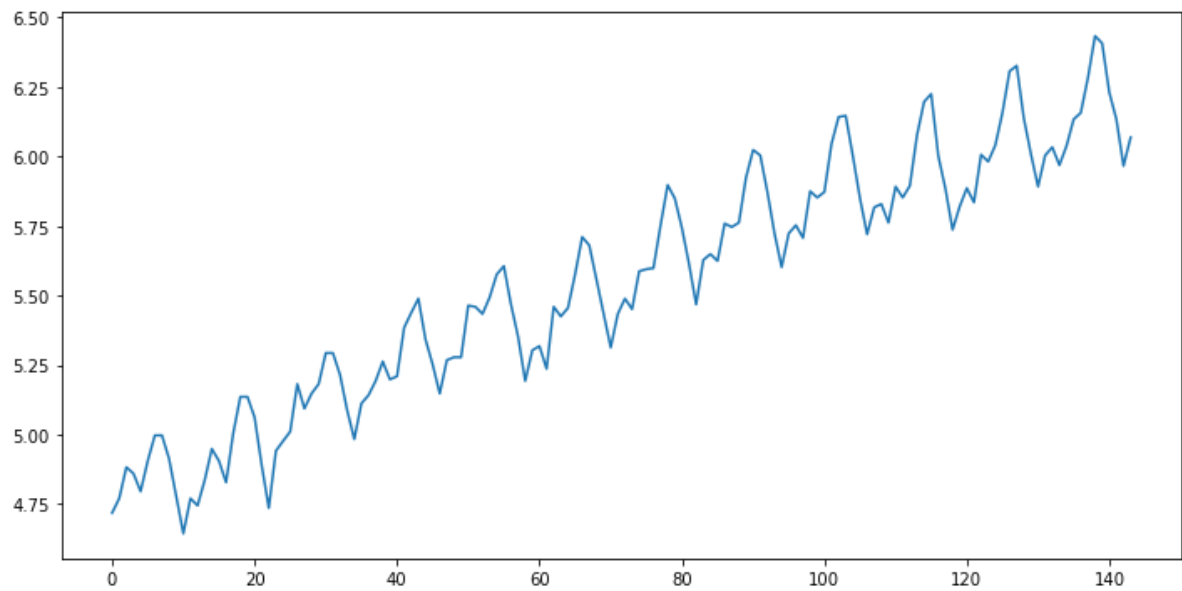
#calculate the log
df['adj_log'] = np.log(df['#Passengers'])

#calculate the square root log
df['adj_sqrt'] = np.sqrt(df['#Passengers'])

#calculate the cubed root
df['adj_cbrt'] = np.cbrt(df['#Passengers'])
```

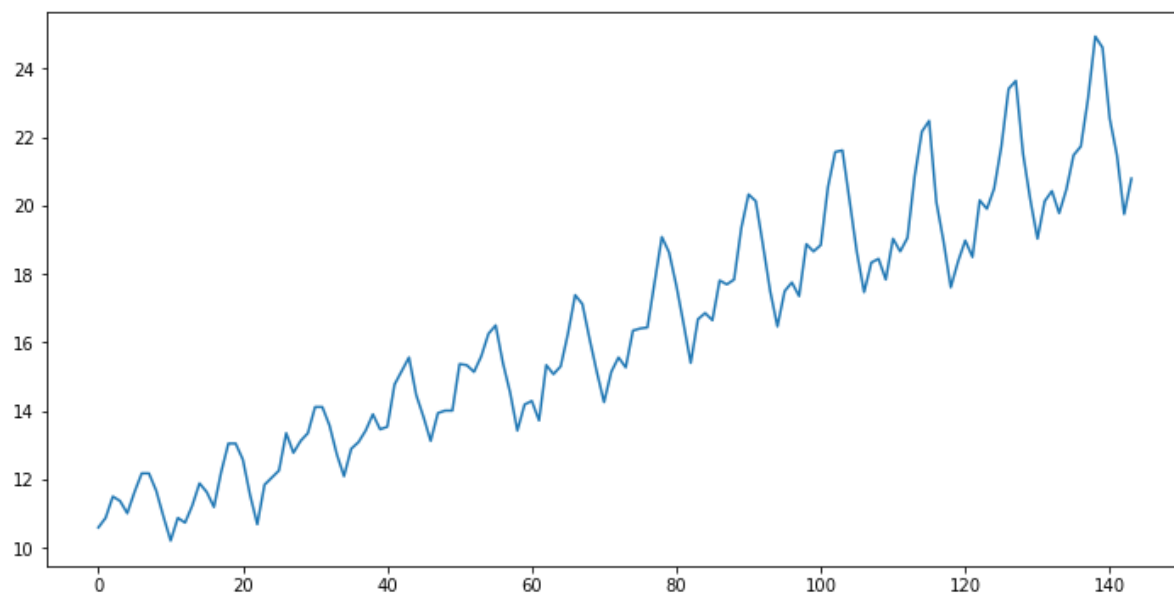
```
In [20]: df['adj_log'].dropna().plot()
```

Out[20]: <AxesSubplot:>



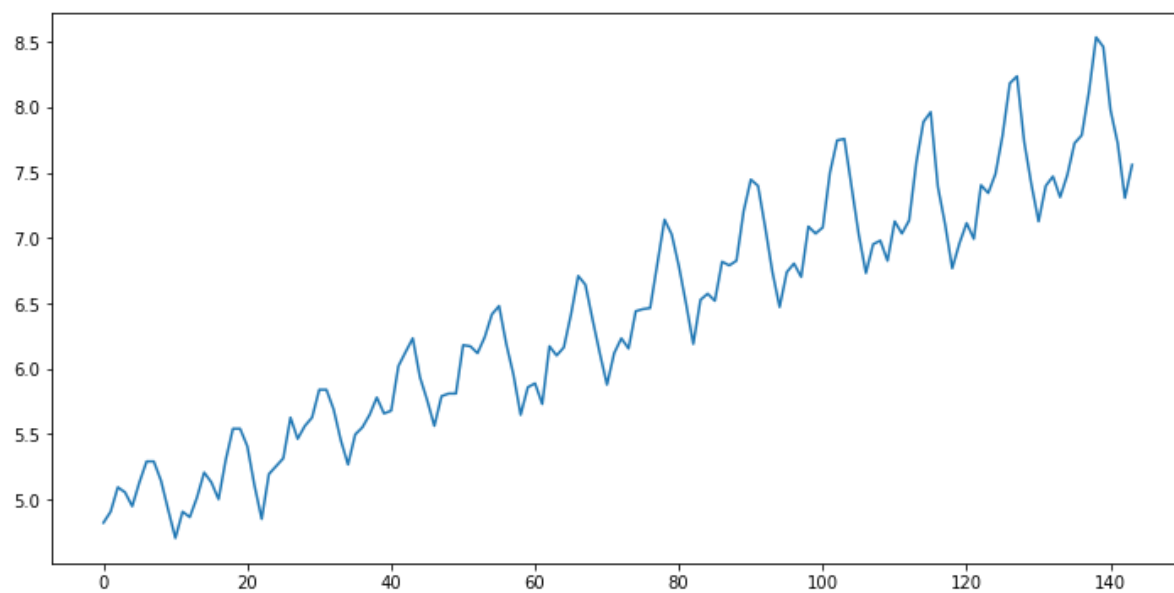
```
In [21]: df['adj_sqrt'].dropna().plot()
```

```
Out[21]: <AxesSubplot:>
```



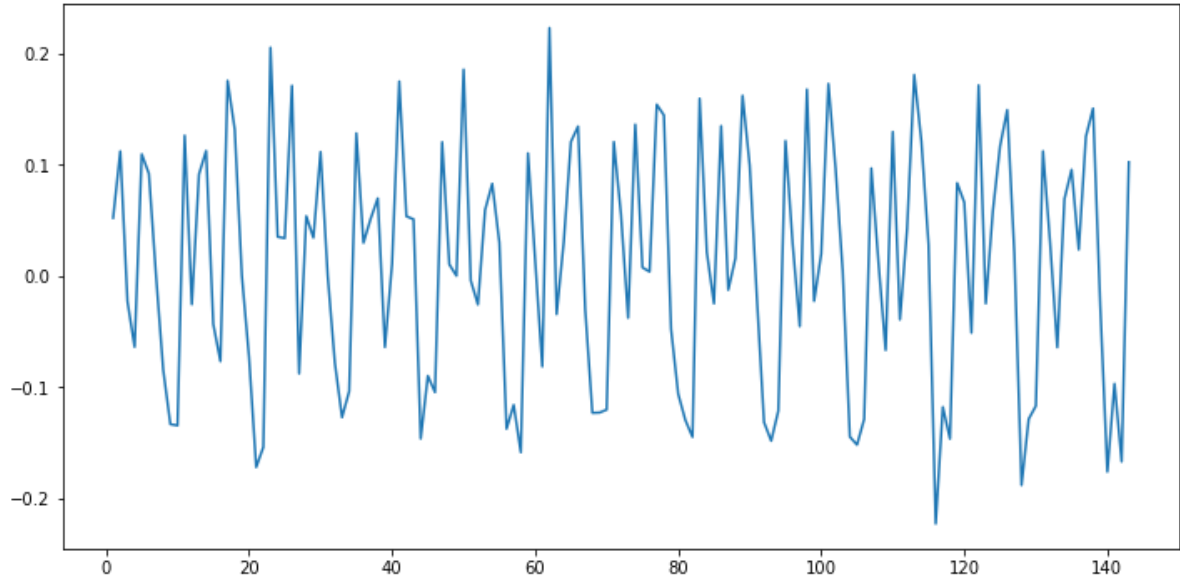
```
In [22]: df['adj_cbrt'].dropna().plot()
```

```
Out[22]: <AxesSubplot:>
```



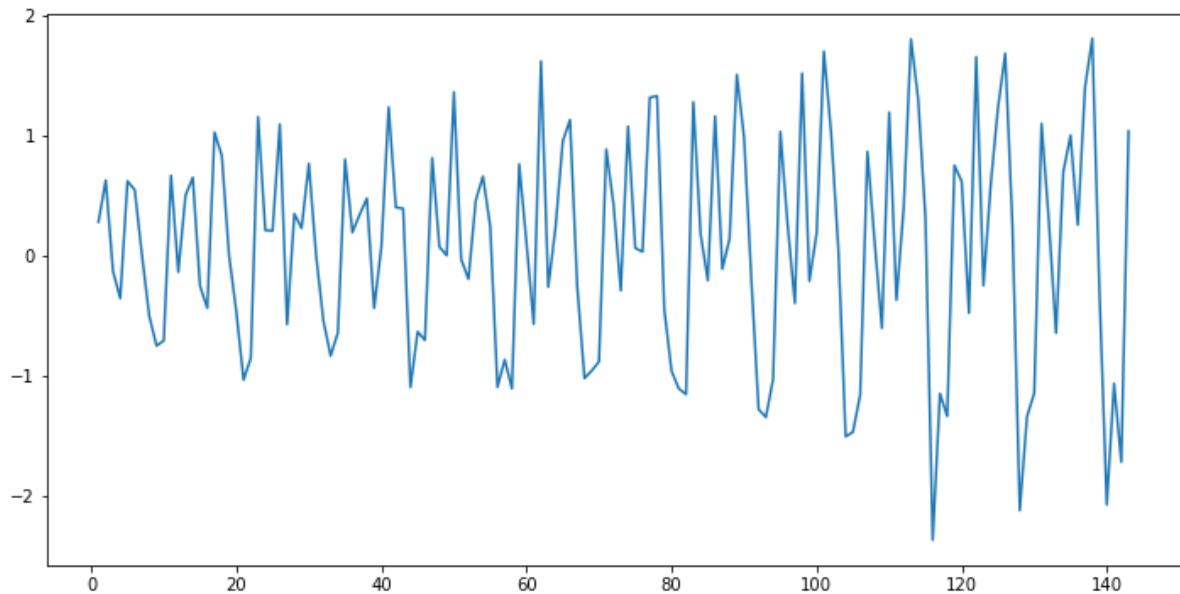
```
In [24]: df['#Passengers_log_diff'] = df['adj_log'] - df['adj_log'].shift(1)
df['#Passengers_log_diff'].dropna().plot()
```

Out[24]: <AxesSubplot:>



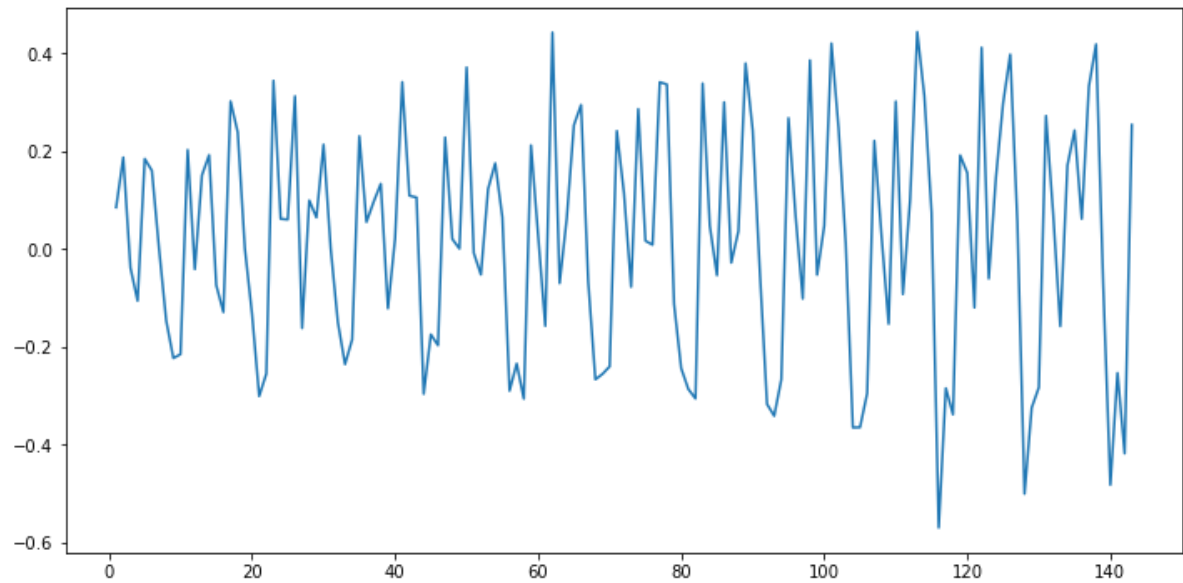
```
In [25]: df['#Passengers_sqrt_diff'] = df['adj_sqrt'] - df['adj_sqrt'].shift(1)
df['#Passengers_sqrt_diff'].dropna().plot()
```

Out[25]: <AxesSubplot:>



```
In [26]: df['#Passengers_cbrt_diff'] = df['adj_cbrt'] - df['adj_cbrt'].shift(1)  
df['#Passengers_cbrt_diff'].dropna().plot()
```

Out[26]: <AxesSubplot:>



In []: