In [45]:

```python
#importing libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

In [46]:

```python
df = pd.read_csv("AirPassengers.csv")
df
```

Out[46]:

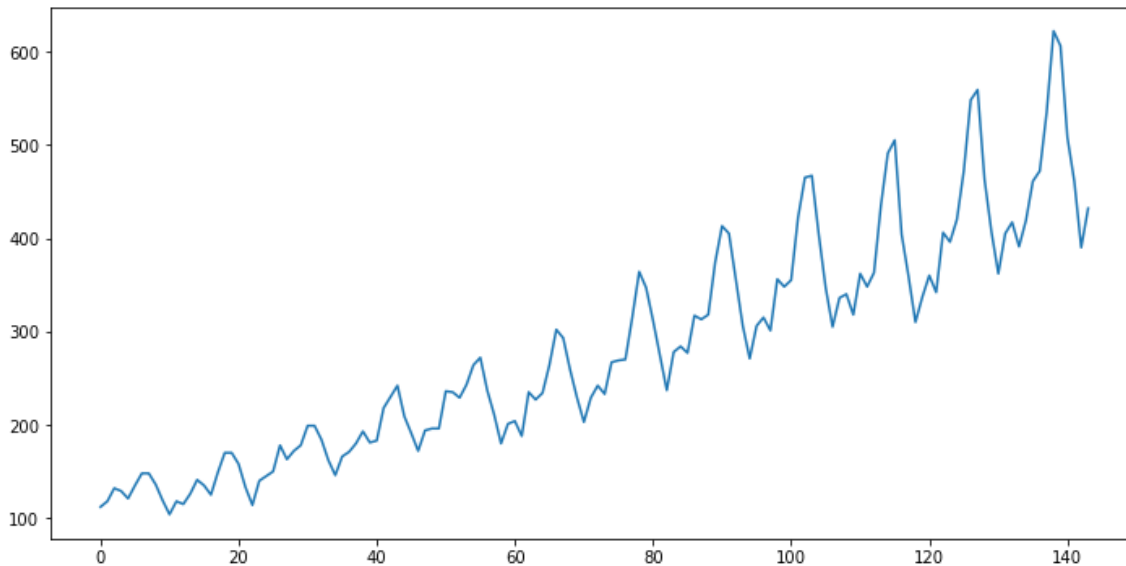|	Month	#Passengers
0	1949-01	112
1	1949-02	118
2	1949-03	132
3	1949-04	129
4	1949-05	121
...	...	...
139	1960-08	606
140	1960-09	508
141	1960-10	461
142	1960-11	390
143	1960-12	432

144 rows × 2 columns

In [47]:

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

Out[47]:

```
<AxesSubplot:>
```


Method 1 - Differencing and Seasonal differencing

In [48]:

```python
df['#Passengers'].shift(1)
```

Out[48]:

```
0        NaN
1      112.0
2      118.0
3      132.0
4      129.0
       ...
139    622.0
140    606.0
141    508.0
142    461.0
143    390.0
Name: #Passengers, Length: 144, dtype: float64
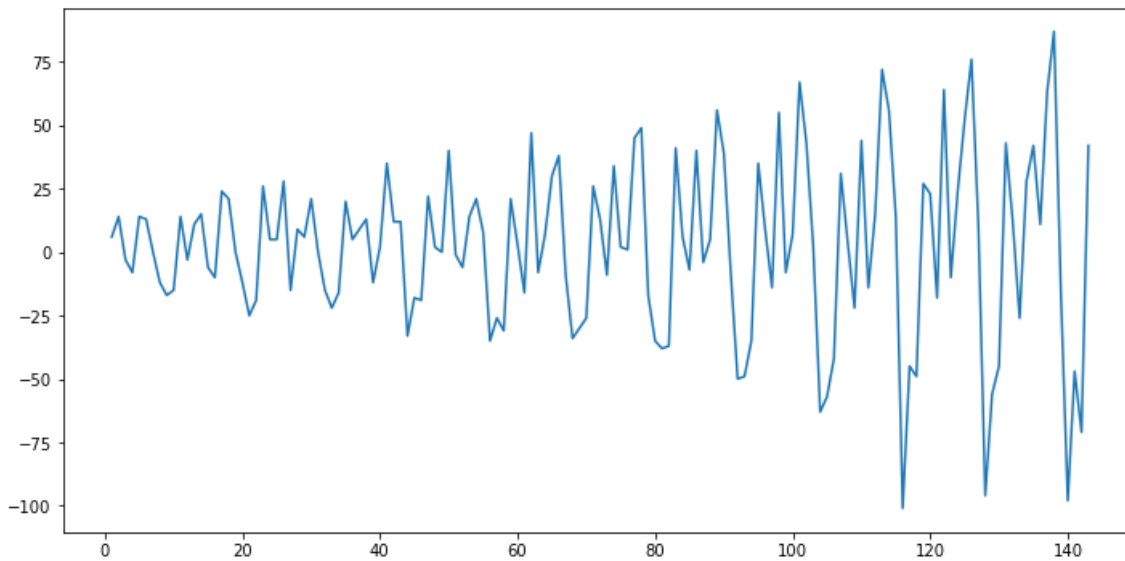```

In [49]:

```python
df['#Passengers_diff'] = df['#Passengers'] - df['#Passengers'].shift(1)
```

In [50]:

```python
df['#Passengers_diff'].dropna().plot()
```

Out[50]:

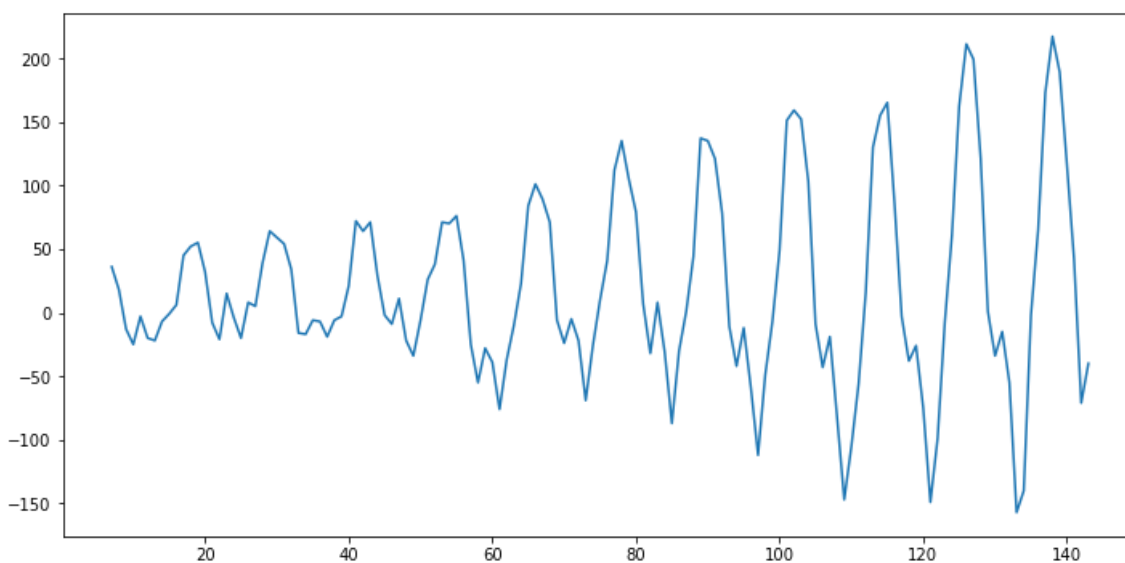<AxesSubplot:>

In [51]:

```python
# Seasonal Differencing meaning - y(t) = y(t) - y(t-n)
```

In [52]:

```python
df['#Passengers_diff_7'] = df['#Passengers'] - df['#Passengers'].shift(7)
df['#Passengers_diff_7'].dropna().plot()
```

Out[52]:

<AxesSubplot:>

Method 2 - Transformation

In [53]:

```python
#Create transformation columns
import numpy as np

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

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

#calculate the cubed root
df['adj_cbrt'] = np.cbrt(df['#Passengers'])
```
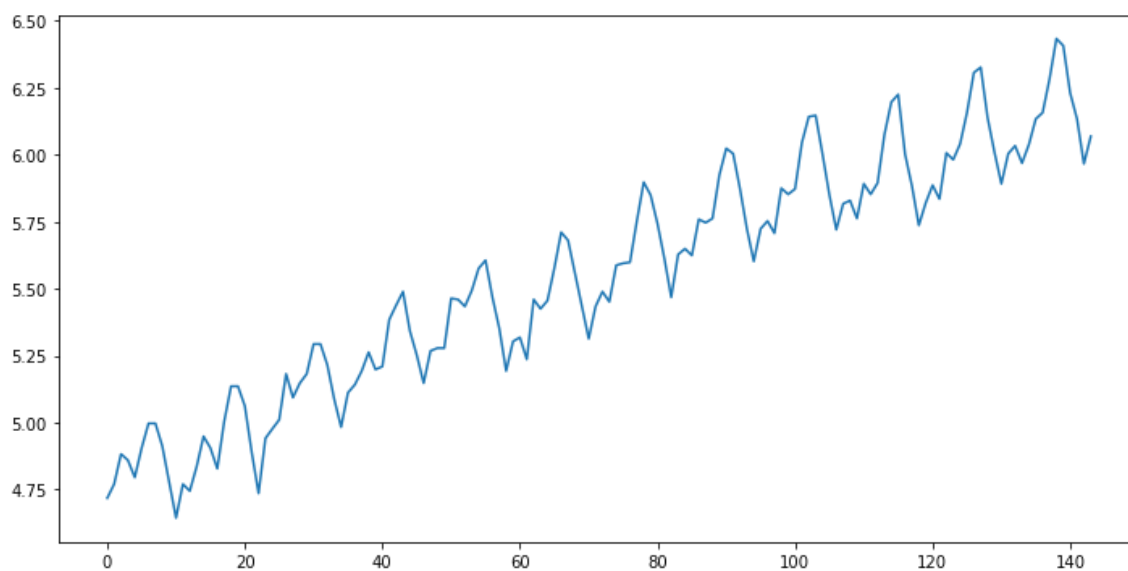
In [54]:

```python
df['adj_log'].dropna().plot()
```
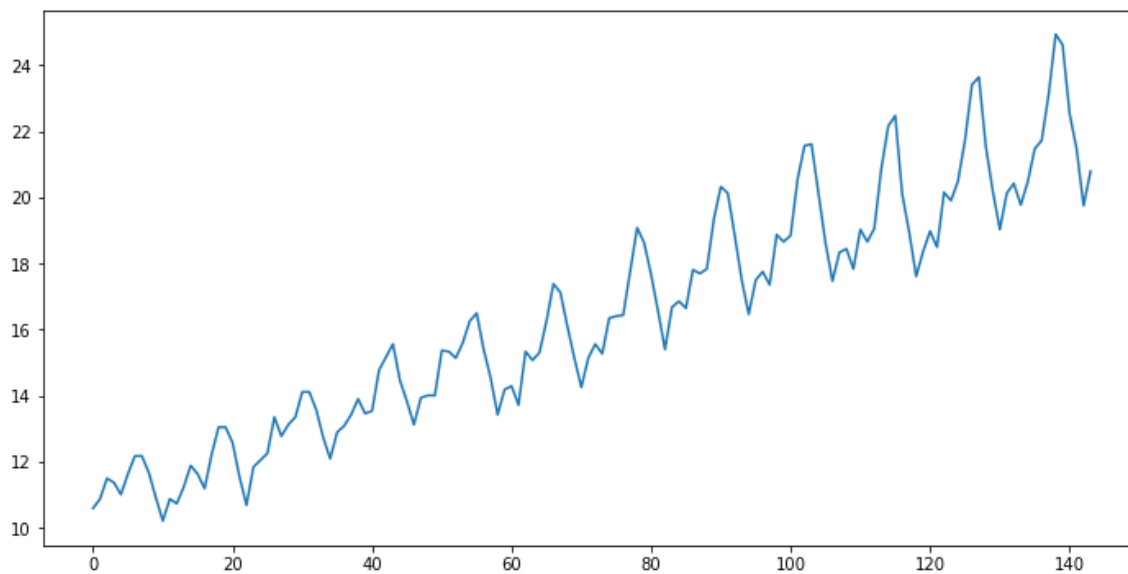
Out[54]:

```
<AxesSubplot:>
```

In [55]:

```python
df['adj_sqrt'].dropna().plot()
```

Out[55]:

```
<AxesSubplot:>
```
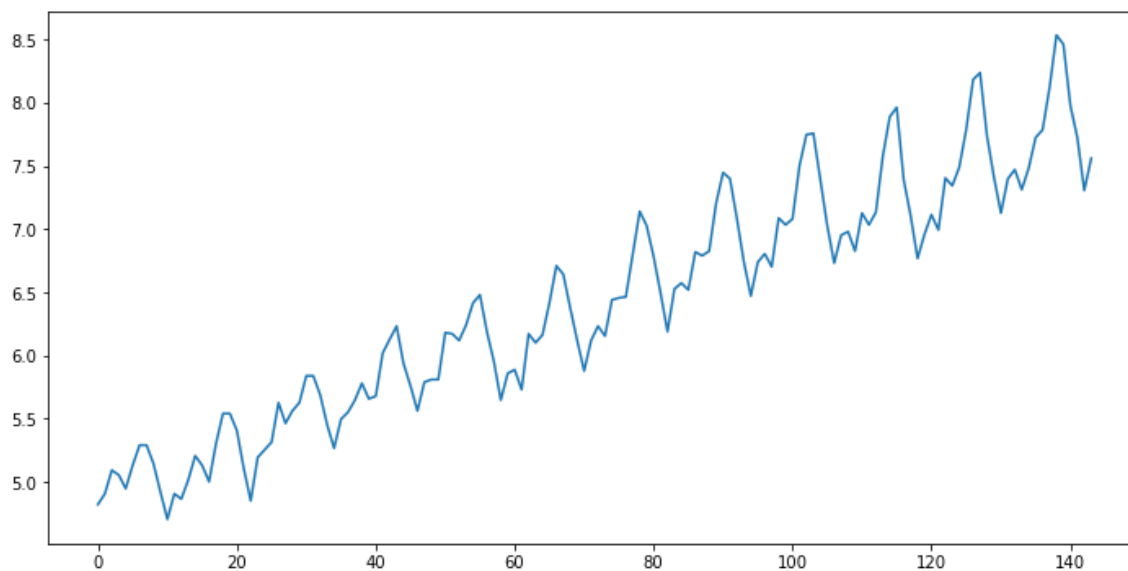

In [56]:

```python
df['adj_cbrt'].dropna().plot()
```

Out[56]:

```
<AxesSubplot:>
```

In [57]:

```python
df['adj_log'].dropna().plot()
df['adj_sqrt'].dropna().plot()
df['adj_cbrt'].dropna().plot()
```
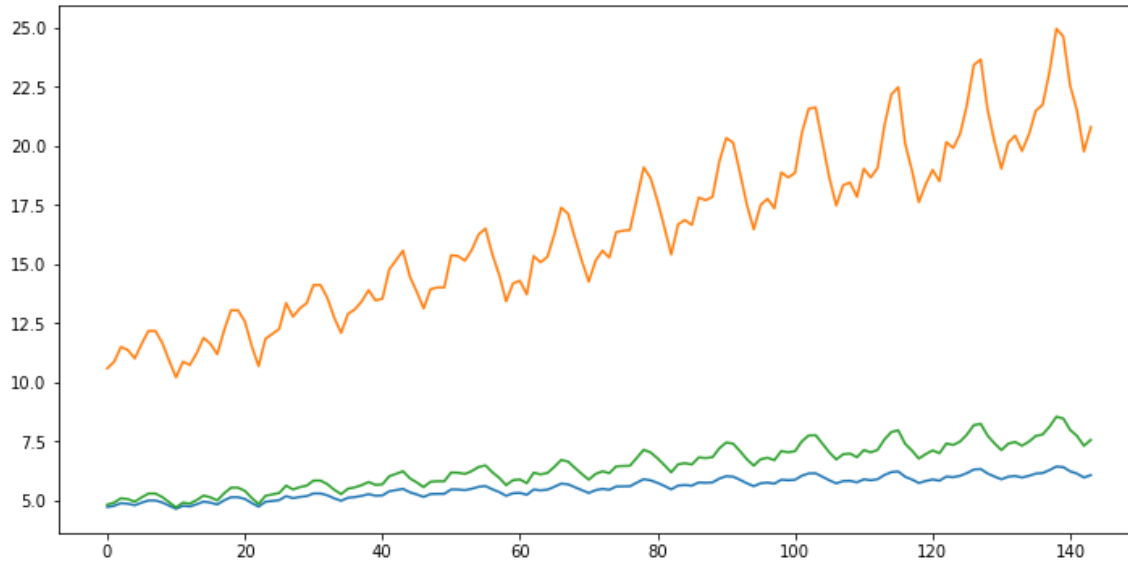
Out[57]:

<AxesSubplot:>

In [58]:

```python
df['training_diff'] = df['adj_log'] - df['adj_log'].shift(1)
df['training_diff'].dropna().plot()
```
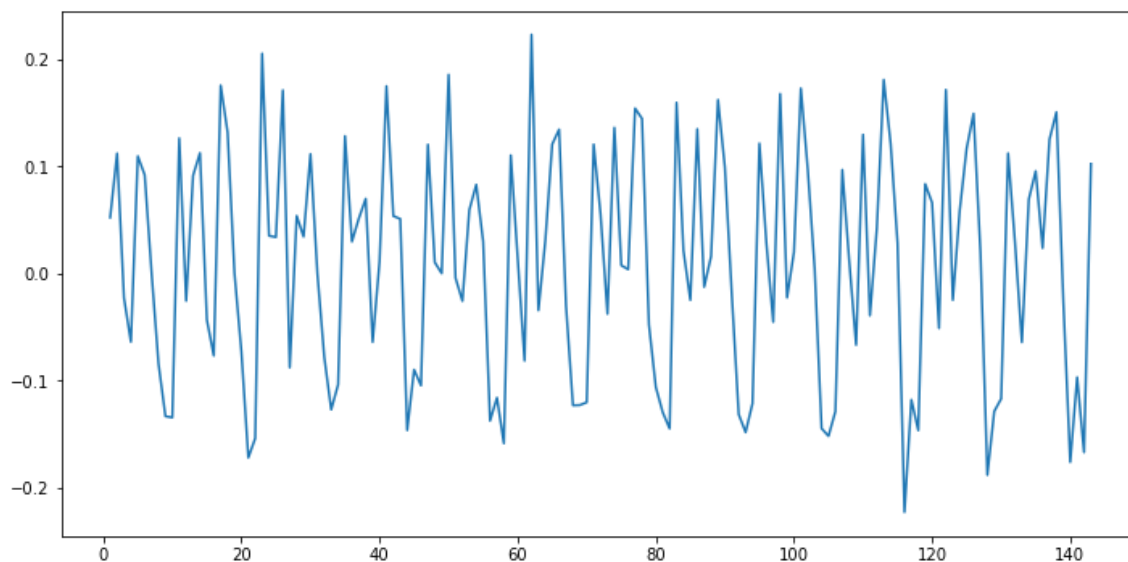
Out[58]:

<AxesSubplot:>

In [ ]:

In [ ]: