In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
df = pd.read_csv("AirPassengers.csv")
df.head()
```

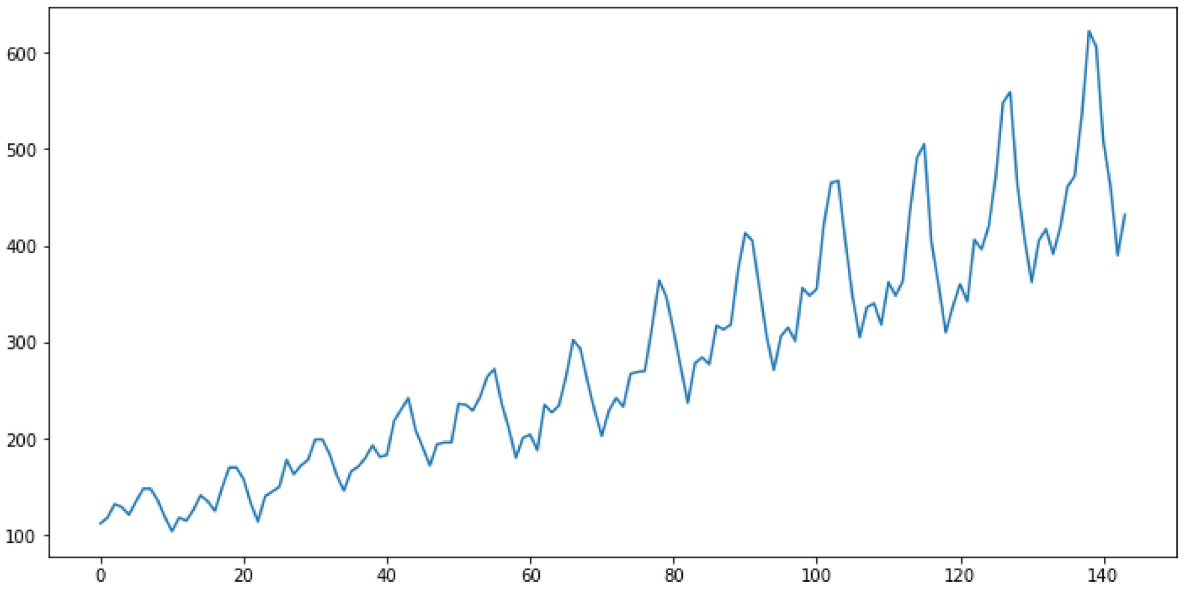
Out[2]:

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

In [3]:
```
df.rename(columns={'#Passengers':'Passengers'},inplace = True)
```

In [4]:
```
plt.rcParams.update({'figure.figsize':(12,6)})
df['Passengers'].plot()
```

Out[4]: <AxesSubplot:>



Method-1 : Differencing and Seasonal differencing

In [5]:
```
# Differening Meaning y(t) = y(t) - y(t-1)
# 118-112 = 3; 129-132=-3
df['Passengers_diff'] = df['Passengers'] - df['Passengers'].shift(1)
```

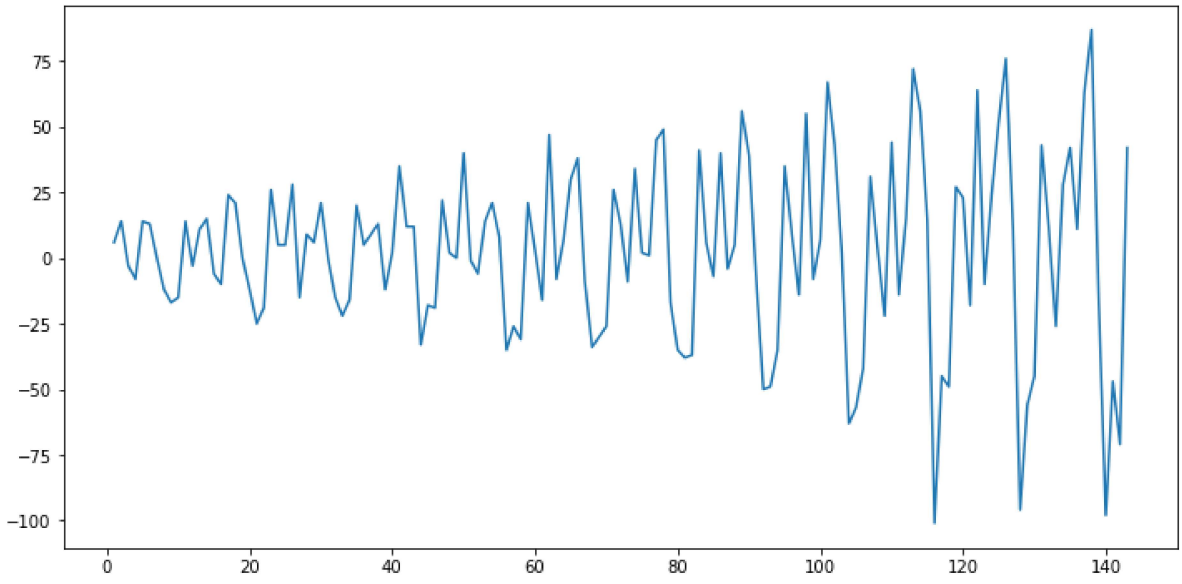
In [6]:
```
df.head()
```

Out[6]:

	Month	Passengers	Passengers_diff
0	1949-01	112	NaN
1	1949-02	118	6.0
2	1949-03	132	14.0
3	1949-04	129	-3.0
4	1949-05	121	-8.0

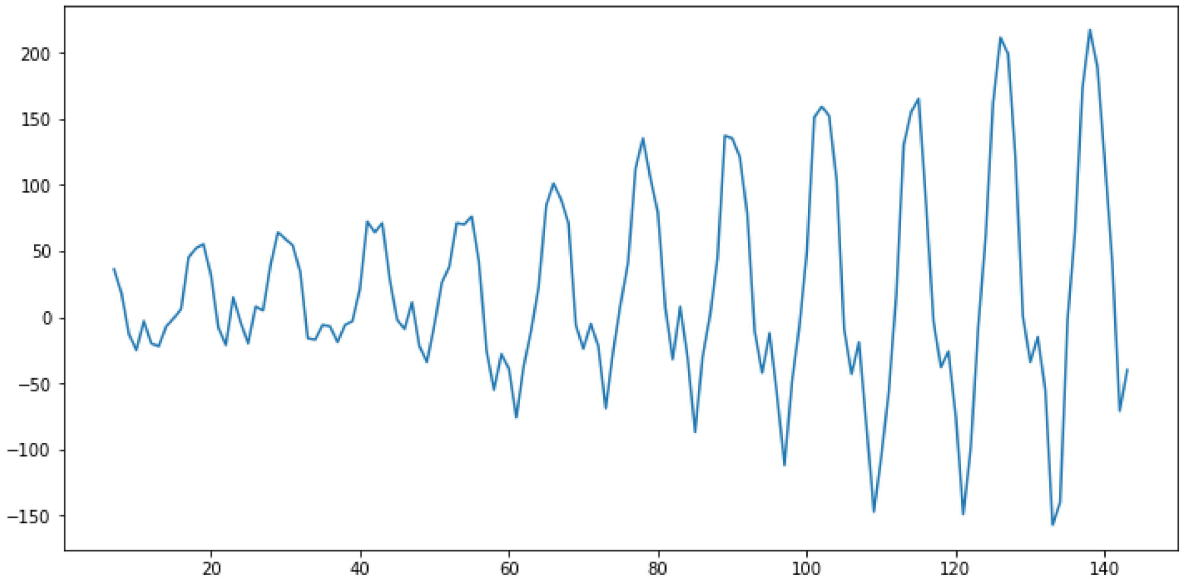
In [7]:
```
df['Passengers_diff'].dropna().plot()
```

Out[7]: <AxesSubplot:>



In [8]:
```
# Seasonal differencing y(t) = y(t) - y(t-n)
df['Passengers_sdiff'] = df['Passengers'] - df['Passengers'].shift(7)
df['Passengers_sdiff'].dropna().plot()
```

Out[8]: <AxesSubplot:>



In [9]:
```
df.head(10)
```

Out[9]:

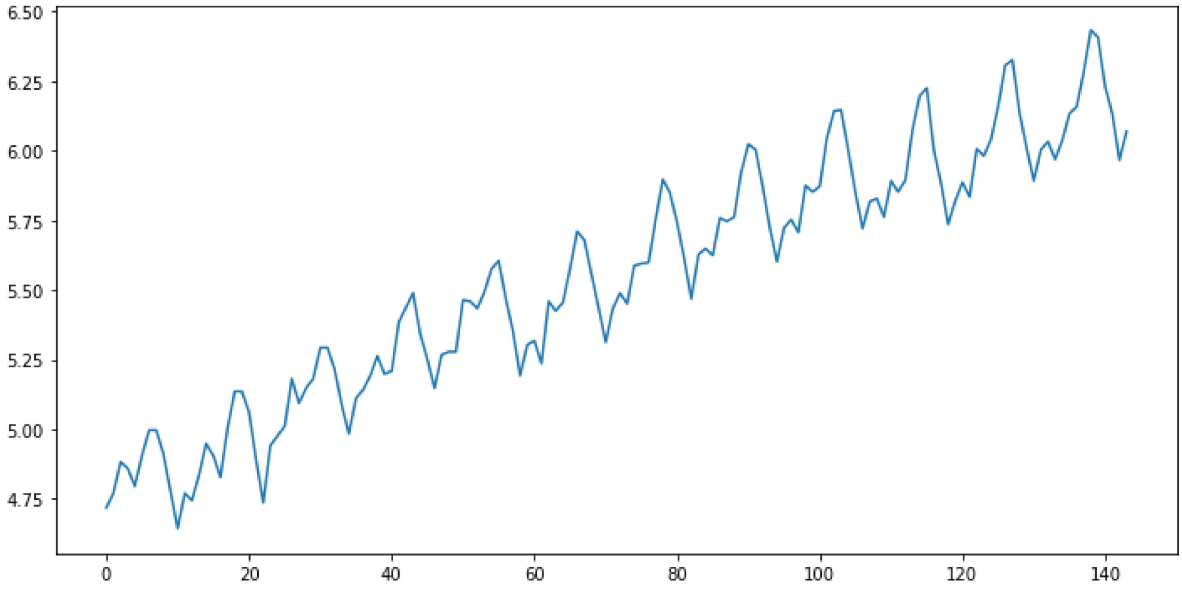
	Month	Passengers	Passengers_diff	Passengers_sdiff
0	1949-01	112	NaN	NaN
1	1949-02	118	6.0	NaN
2	1949-03	132	14.0	NaN
3	1949-04	129	-3.0	NaN
4	1949-05	121	-8.0	NaN
5	1949-06	135	14.0	NaN
6	1949-07	148	13.0	NaN
7	1949-08	148	0.0	36.0
8	1949-09	136	-12.0	18.0
9	1949-10	119	-17.0	-13.0

Method-2: Transformation

In [13]:
```
#create transformation column
#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 cube root
df['adj_cbrt'] = np.cbrt(df['Passengers'])
```

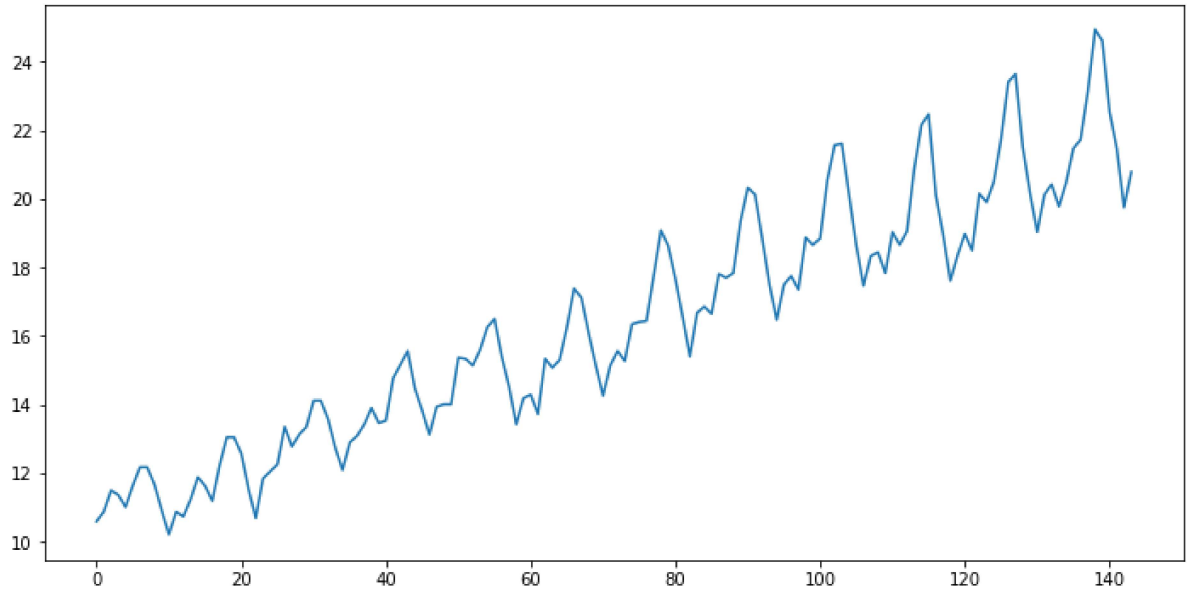
In [14]:
```
df['adj_log'].dropna().plot()
```

Out[14]: <AxesSubplot:>



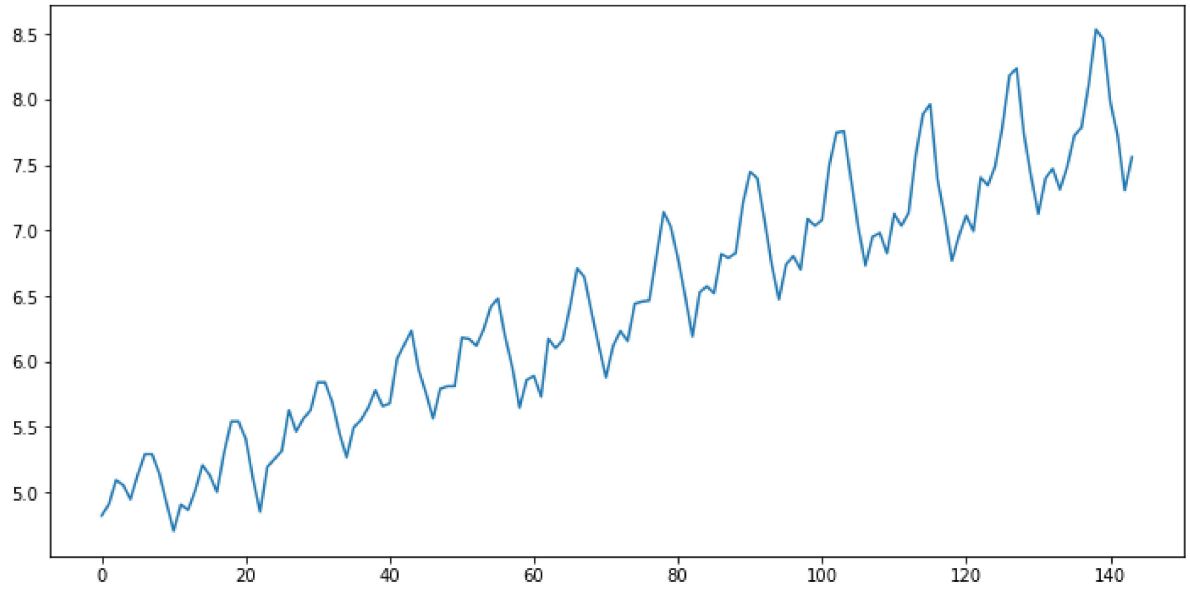
In [16]:
```
df['adj_sqrt'].dropna().plot()
```

Out[16]: <AxesSubplot:>



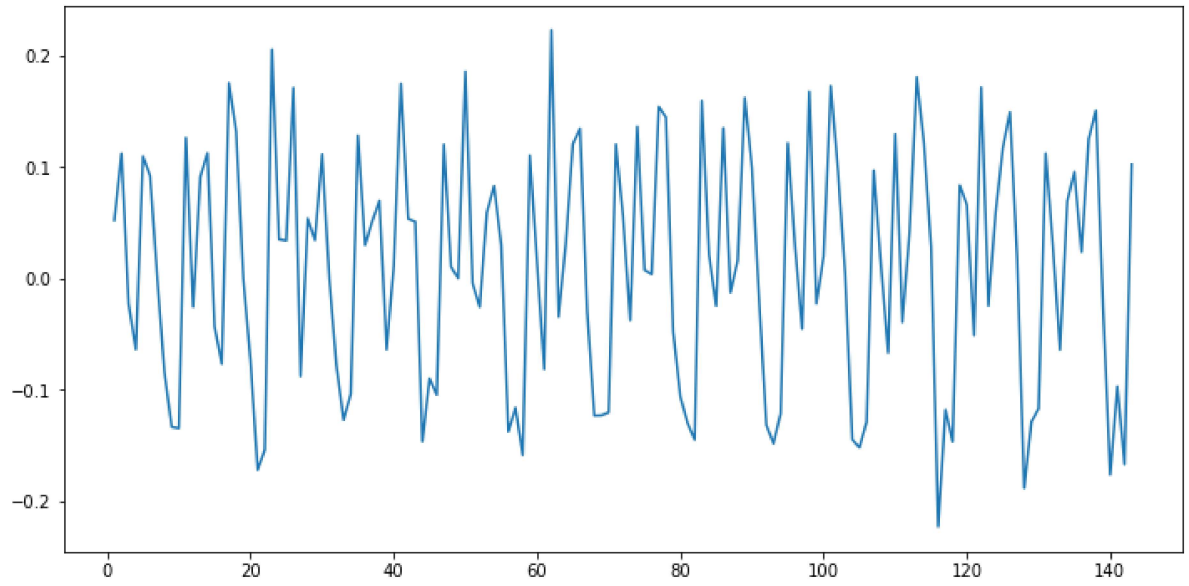
In [17]:
```
df['adj_cbrt'].dropna().plot()
```

Out[17]: <AxesSubplot:>



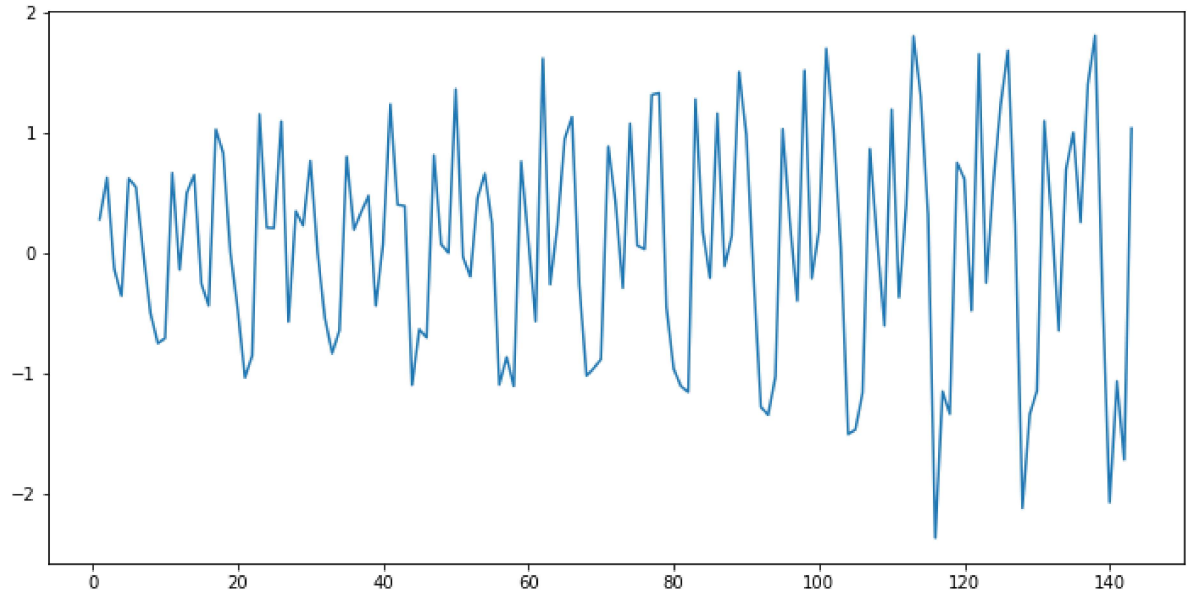
In [18]:
```
df['Passengers_log_diff'] = df['adj_log'] - df['adj_log'].shift(1)
df['Passengers_log_diff'].dropna().plot()
```

Out[18]: <AxesSubplot:>



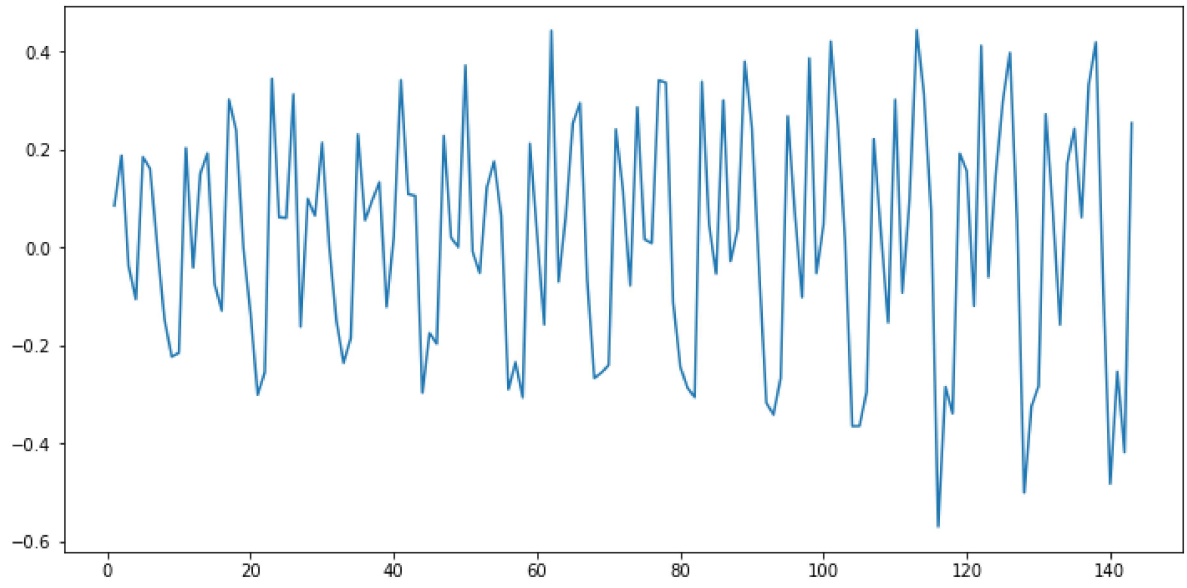
In [19]:
```
df['Passengers_sqrt_diff'] = df['adj_sqrt'] - df['adj_sqrt'].shift(1)
df['Passengers_sqrt_diff'].dropna().plot()
```

Out[19]: <AxesSubplot:>



In [20]:
```
df['Passengers_cbrt_diff'] = df['adj_cbrt'] - df['adj_cbrt'].shift(1)
df['Passengers_cbrt_diff'].dropna().plot()
```

Out[20]: <AxesSubplot:>



In [ ]: