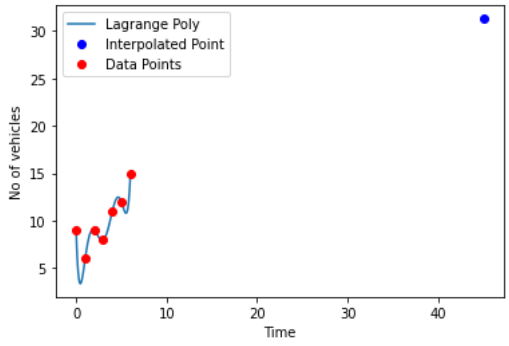
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

# Function to calculate Lagrange polynomial
def lagrange_poly(x, y):
    n = len(x)
    p = np.poly1d(0.0)
    for i in range(n):
        L = np.poly1d(y[i])
        for j in range(n):
            if j != i:
                L *= np.poly1d([1.0, -x[j]]) / (x[i] - x[j])
        p += L
    return p


##TASK 1
# Read data from CSV file
df = pd.read_csv('traffic.csv')

# Convert data to numpy arrays
x = df['Time'].values
y = df['No of vehicles'].values


#TASK 2
# Calculate Lagrange polynomial
p = lagrange_poly(x[0:7], y[0:7])


# Interpolate at a specific point
point = float(input("Enter x-coordinate to interpolate: "))
interp_value = p(point)

# Print Lagrange polynomial and interpolated value
print("Lagrange polynomial is:")
print(p)
print("Interpolated value at x =", point, "is:", interp_value)

#TASK 3

xi=45
yi=31.29079589843832
xp=np.linspace(0,x[6],100)
yp=p(xp)

plt.plot(xp, yp, label='Lagrange Poly')
plt.plot(xi, yi, 'bo', label='Interpolated Point')
plt.plot(x[0:7], y[0:7], 'ro', label='Data Points')
plt.xlabel('Time')
plt.ylabel('No of vehicles')
plt.legend()
plt.show()
```

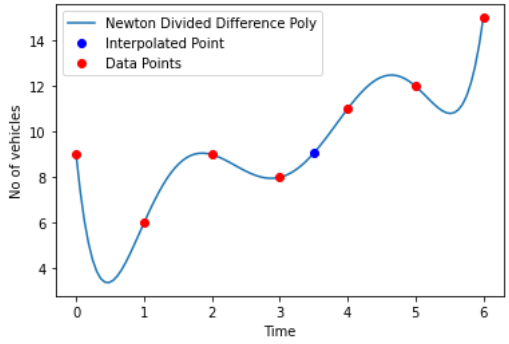
```
Enter x-coordinate to interpolate: 3.5
Lagrange polynomial is:
         6         5         4      3         2
0.07778 x - 1.433 x + 10.03 x - 33 x + 50.89 x - 29.57 x + 9
Interpolated value at x = 3.5 is: 9.054687499999055
```




```
#TASK 4

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
def divided_difference_table(x, y):
    n = len(x)
    F = [[0] * n for i in range(n)]
    for i in range(n):
        F[i][0] = y[i]
    for j in range(1, n):
        for i in range(j, n):
            F[i][j] = (F[i][j-1] - F[i-1][j-1]) / (x[i] - x[i-j])
    return F


def newton_div_dif_poly(x,y,xi):
   F=divided_difference_table(x,y) # Saving divided difference in a variable F
   n=len(x)
   prod=np.poly1d(1)
   N=np.poly1d(F[0][0])
   for i in range(1,n):
     prod=np.poly1d(x[0:i],True)
     N+=np.poly1d(F[i][i]*(prod.c))
   return (N)

df = pd.read_csv('traffic.csv')


x = df['Time'].values
y = df['No of vehicles'].values
Z=newton_div_dif_poly(x[0:7], y[0:7],3.5)
print(Z)


xi=3.5
yi=Z(3.5)
xp=np.linspace(0,x[6],100)
yp=p(xp)

plt.plot(xp, yp, label='Newton Divided Difference Poly')
plt.plot(xi, yi, 'bo', label='Interpolated Point')
plt.plot(x[0:7], y[0:7], 'ro', label='Data Points')
plt.xlabel('Time')
plt.ylabel('No of vehicles')
plt.legend()
plt.show()
```

```
          6         5         4      3         2
0.07778 x - 1.433 x + 10.03 x - 33 x + 50.89 x - 29.57 x + 9
```



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