```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns


# Load the datasets
transactions = pd.read_csv('/content/Transactions.csv')
products = pd.read_csv('/content/Products.csv')
customers = pd.read_csv('/content/Customers.csv')


transactions
```

	TransactionID	CustomerID	ProductID	TransactionDate	Quantity	TotalValue	Price
0	T00001	C0199	P067	2024-08-25 12:38:23	1	300.68	300.68
1	T00112	C0146	P067	2024-05-27 22:23:54	1	300.68	300.68
2	T00166	C0127	P067	2024-04-25 07:38:55	1	300.68	300.68
3	T00272	C0087	P067	2024-03-26 22:55:37	2	601.36	300.68
4	T00363	C0070	P067	2024-03-21 15:10:10	3	902.04	300.68
...	...	...	...	...	...	...	...
995	T00496	C0118	P037	2024-10-24 08:30:27	1	459.86	459.86
996	T00759	C0059	P037	2024-06-04 02:15:24	3	1379.58	459.86
997	T00922	C0018	P037	2024-04-05 13:05:32	4	1839.44	459.86
998	T00959	C0115	P037	2024-09-29 10:16:02	2	919.72	459.86
999	T00992	C0024	P037	2024-04-21 10:52:24	1	459.86	459.86

1000 rows × 7 columns

Next steps: Generate code with transactions View recommended plots New interactive sheet

```
print("Transactions Data:")
print(transactions.info())
```

```
Transactions Data:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   TransactionID    1000 non-null   object 
 1   CustomerID       1000 non-null   object 
 2   ProductID        1000 non-null   object 
 3   TransactionDate  1000 non-null   object 
 4   Quantity         1000 non-null   int64  
 5   TotalValue       1000 non-null   float64
 6   Price            1000 non-null   float64
dtypes: float64(2), int64(1), object(4)
memory usage: 54.8+ KB
None
```

```
print("\nProducts Data:")
print(products.info())
```

```

Products Data:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 4 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   ProductID    100 non-null    object 
 1   ProductName  100 non-null    object 
 2   Category     100 non-null    object 
 3   Price        100 non-null    float64
dtypes: float64(1), object(3)
memory usage: 3.3+ KB
None
```

```
print("\nCustomers Data:")
print(customers.info())
```

```

Customers Data:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
```

```
Data columns (total 4 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   CustomerID    200 non-null    object
 1   CustomerName  200 non-null    object
 2   Region        200 non-null    object
 3   SignupDate    200 non-null    object
dtypes: object(4)
memory usage: 6.4+ KB
None
```

```
# Merge datasets for comprehensive analysis
merged_data = pd.merge(transactions, products, on='ProductID')
merged_data = pd.merge(merged_data, customers, on='CustomerID')
```

```
merged_data
```

	TransactionID	CustomerID	ProductID	TransactionDate	Quantity	TotalValue	Price_x	ProductName	Category	Price_y	CustomerI
0	T00001	C0199	P067	2024-08-25 12:38:23	1	300.68	300.68	ComfortLiving Bluetooth Speaker	Electronics	300.68	An Jer
1	T00112	C0146	P067	2024-05-27 22:23:54	1	300.68	300.68	ComfortLiving Bluetooth Speaker	Electronics	300.68	Bri Ha
2	T00166	C0127	P067	2024-04-25 07:38:55	1	300.68	300.68	ComfortLiving Bluetooth Speaker	Electronics	300.68	Kat Ste
3	T00272	C0087	P067	2024-03-26 22:55:37	2	601.36	300.68	ComfortLiving Bluetooth Speaker	Electronics	300.68	T Cam
4	T00363	C0070	P067	2024-03-21 15:10:10	3	902.04	300.68	ComfortLiving Bluetooth Speaker	Electronics	300.68	Timothy F
...	...	...	...	...	...	...	...	...	...	...	
995	T00496	C0118	P037	2024-10-24 08:30:27	1	459.86	459.86	SoundWave Smartwatch	Electronics	459.86	Jacob
996	T00759	C0059	P037	2024-06-04 02:15:24	3	1379.58	459.86	SoundWave Smartwatch	Electronics	459.86	Mrs. Kim W
997	T00922	C0018	P037	2024-04-05 13:05:32	4	1839.44	459.86	SoundWave Smartwatch	Electronics	459.86	Tyler Ha
998	T00959	C0115	P037	2024-09-29 10:16:02	2	919.72	459.86	SoundWave Smartwatch	Electronics	459.86	Jo Ham
999	T00992	C0024	P037	2024-04-21 10:52:24	1	459.86	459.86	SoundWave Smartwatch	Electronics	459.86	Mic Cc

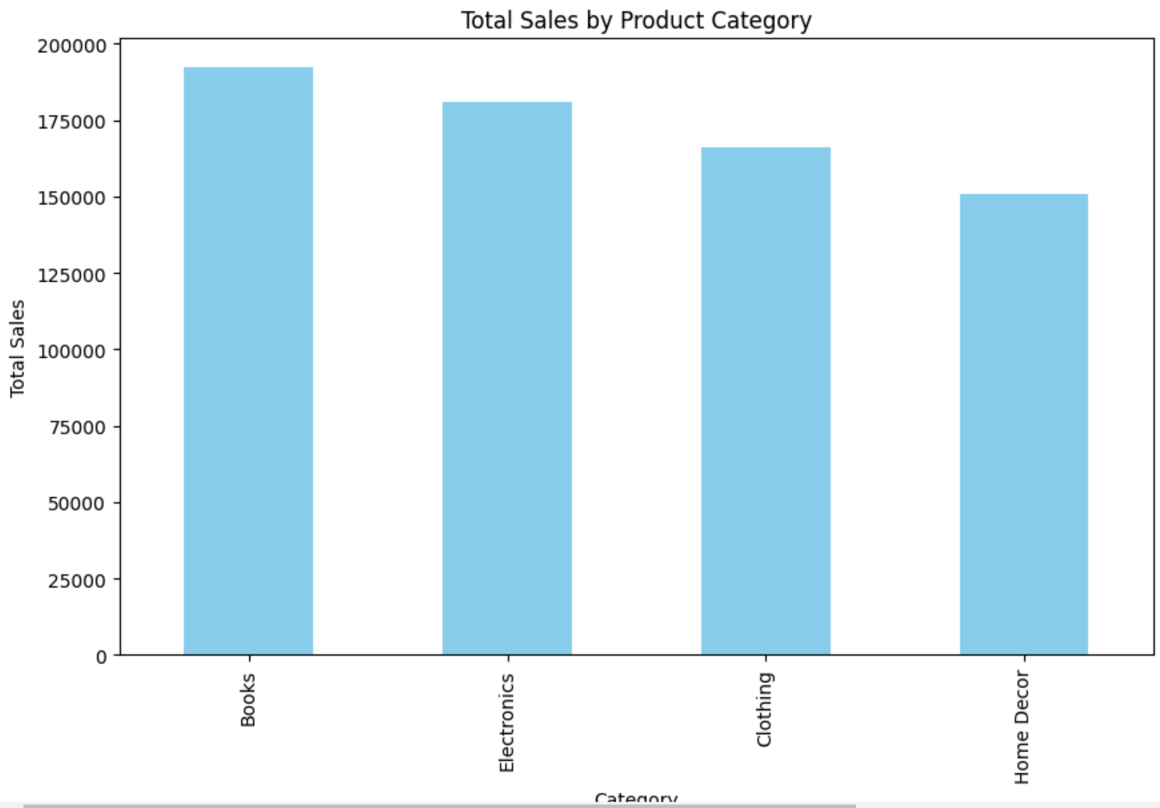
1000 rows × 13 columns

Next steps: Generate code with merged_data View recommended plots New interactive sheet

```
# 1. Total Sales by Product Category
sales_by_category = merged_data.groupby('Category')['TotalValue'].sum().sort_values(ascending=False)
print("\nTotal Sales by Product Category:")
print(sales_by_category)
```

```
Total Sales by Product Category:
Category
Books          192147.47
Electronics    180783.50
Clothing       166170.66
Home Decor     150893.93
Name: TotalValue, dtype: float64
```

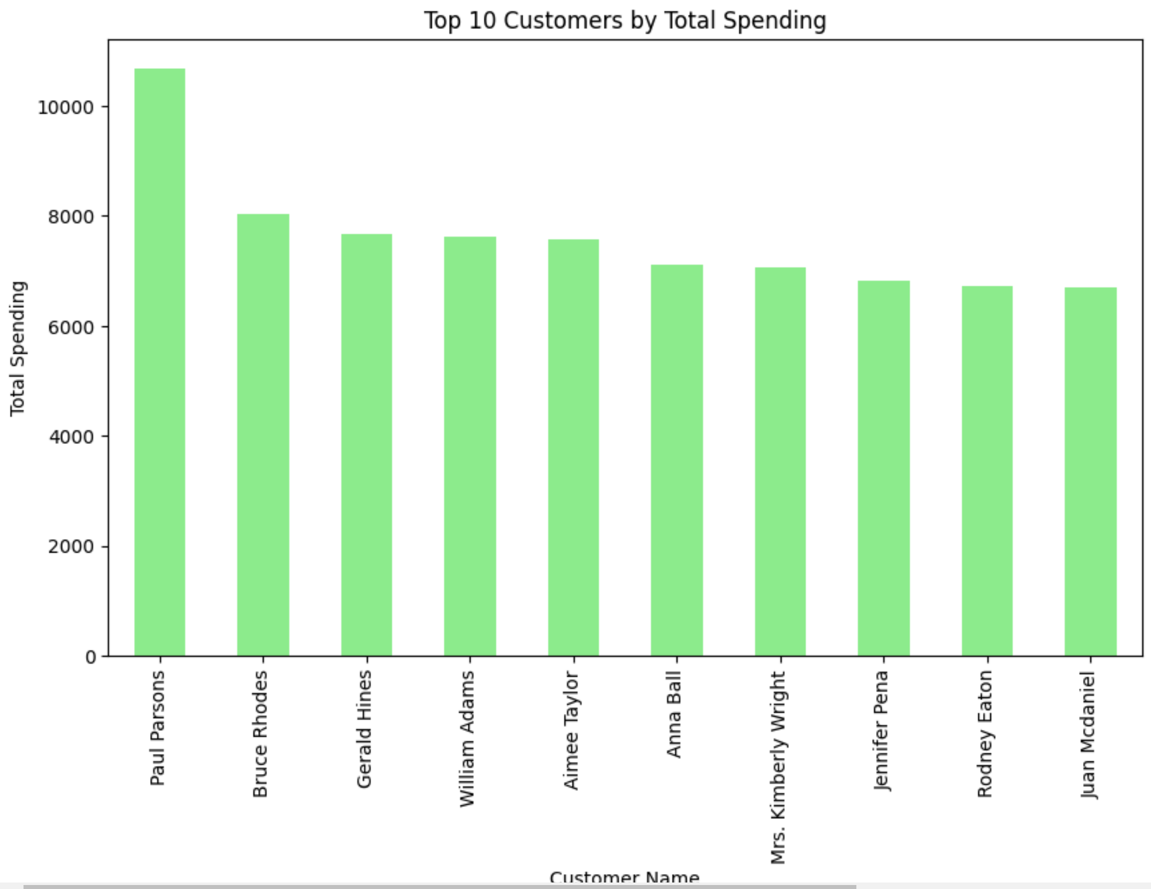
```
# Plotting Total Sales by Product Category
plt.figure(figsize=(10, 6))
sales_by_category.plot(kind='bar', color='skyblue')
plt.title('Total Sales by Product Category')
plt.xlabel('Category')
plt.ylabel('Total Sales')
plt.show()
```



```
# 2. Top 10 Customers by Total Spending
top_customers = merged_data.groupby('CustomerName')['TotalValue'].sum().sort_values(ascending=False).head(10)
print("\nTop 10 Customers by Total Spending:")
print(top_customers)
```

```
Top 10 Customers by Total Spending:
CustomerName
Paul Parsons           10673.87
Bruce Rhodes            8040.39
Gerald Hines            7663.70
William Adams           7634.45
Aimee Taylor            7572.91
Anna Ball               7111.32
Mrs. Kimberly Wright    7073.28
Jennifer Pena           6819.57
Rodney Eaton            6715.72
Juan Mcdaniel           6708.10
Name: TotalValue, dtype: float64
```

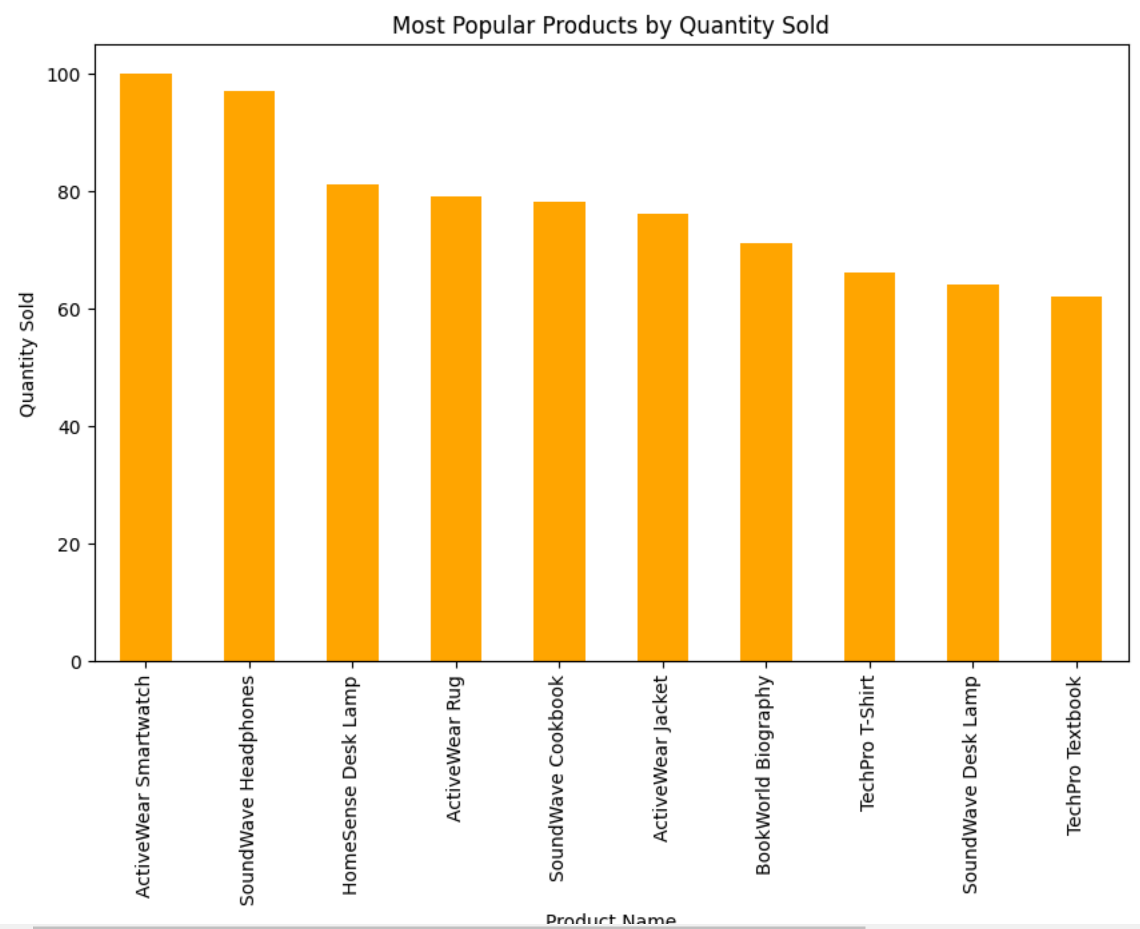
```
# Plotting Top 10 Customers by Total Spending
plt.figure(figsize=(10, 6))
top_customers.plot(kind='bar', color='lightgreen')
plt.title('Top 10 Customers by Total Spending')
plt.xlabel('Customer Name')
plt.ylabel('Total Spending')
plt.show()
```



```
# 3. Most Popular Products by Quantity Sold
popular_products = merged_data.groupby('ProductName')['Quantity'].sum().sort_values(ascending=False).head(10)
print("\nMost Popular Products by Quantity Sold:")
print(popular_products)
```

```
Most Popular Products by Quantity Sold:
ProductName
ActiveWear Smartwatch    100
SoundWave Headphones      97
HomeSense Desk Lamp       81
ActiveWear Rug            79
SoundWave Cookbook        78
ActiveWear Jacket         76
BookWorld Biography       71
TechPro T-Shirt           66
SoundWave Desk Lamp       64
TechPro Textbook          62
Name: Quantity, dtype: int64
```

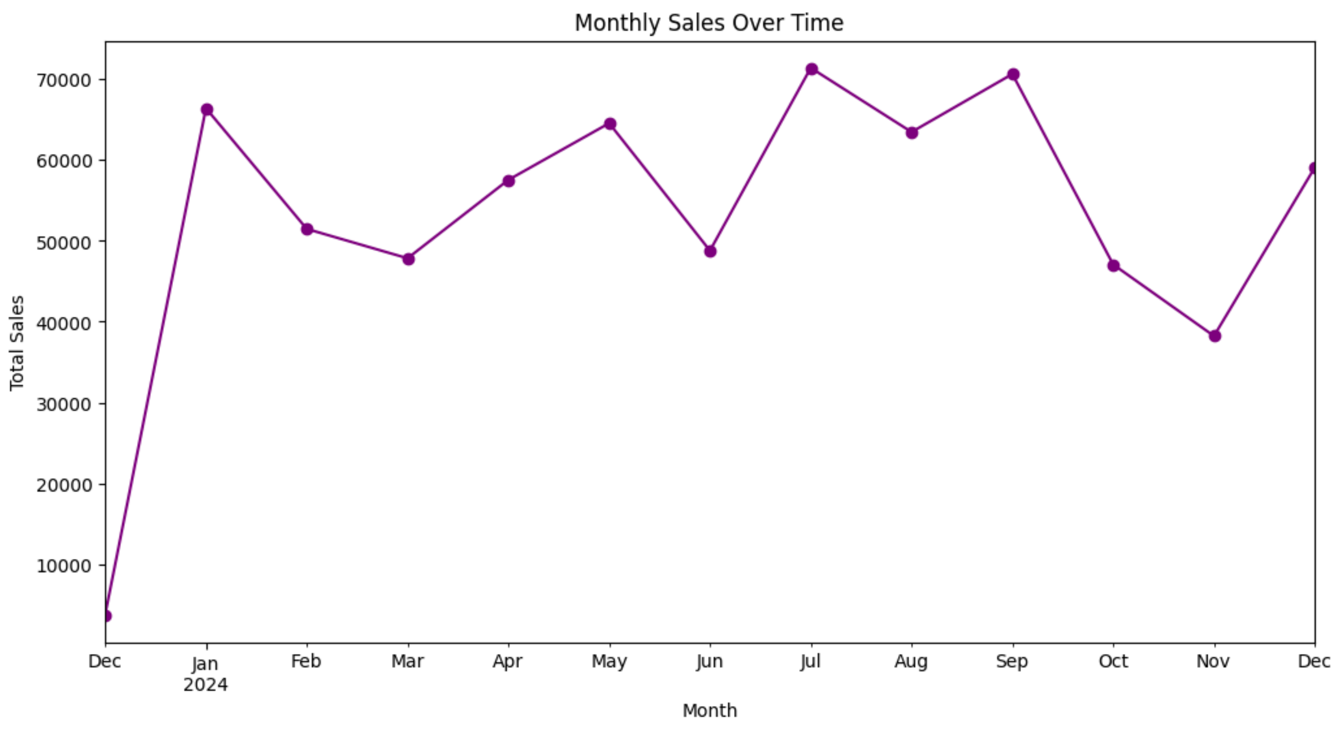
```
# Plotting Most Popular Products by Quantity Sold
plt.figure(figsize=(10, 6))
popular_products.plot(kind='bar', color='orange')
plt.title('Most Popular Products by Quantity Sold')
plt.xlabel('Product Name')
plt.ylabel('Quantity Sold')
plt.show()
```



```
# 4. Sales Distribution Over Time
merged_data['TransactionDate'] = pd.to_datetime(merged_data['TransactionDate'])
merged_data['Month'] = merged_data['TransactionDate'].dt.to_period('M')
monthly_sales = merged_data.groupby('Month')['TotalValue'].sum()
print("\nMonthly Sales:")
print(monthly_sales)
```

```
Monthly Sales:
Month
2023-12     3769.52
2024-01    66376.39
2024-02    51459.27
2024-03    47828.73
2024-04    57519.06
2024-05    64527.74
2024-06    48771.18
2024-07    71366.39
2024-08    63436.74
2024-09    70603.75
2024-10    47063.22
2024-11    38224.37
2024-12    59049.20
Freq: M, Name: TotalValue, dtype: float64
```

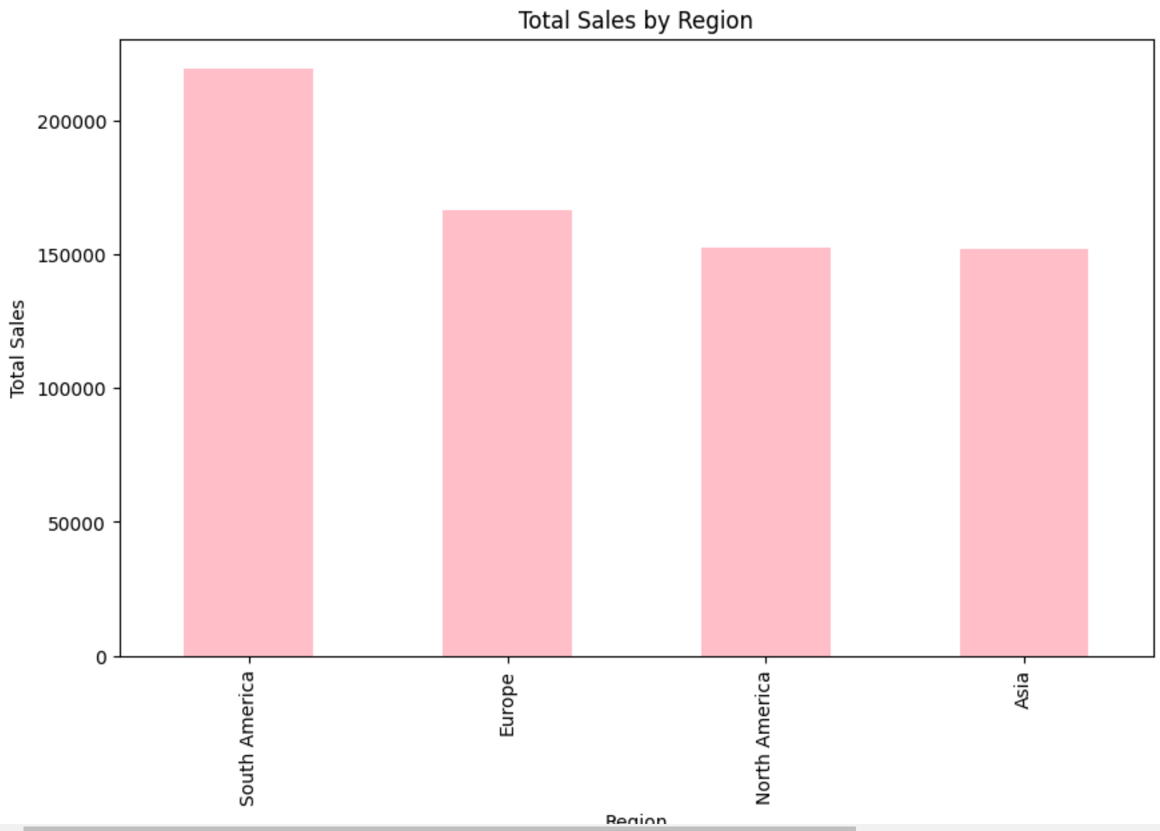
```
# Plotting Monthly Sales
plt.figure(figsize=(12, 6))
monthly_sales.plot(kind='line', marker='o', color='purple')
plt.title('Monthly Sales Over Time')
plt.xlabel('Month')
plt.ylabel('Total Sales')
plt.show()
```



```
# 5. Customer Region Analysis
region_sales = merged_data.groupby('Region')['TotalValue'].sum().sort_values(ascending=False)
print("\nTotal Sales by Region:")
print(region_sales)
```

```
Total Sales by Region:
Region
South America    219352.56
Europe           166254.63
North America    152313.40
Asia             152074.97
Name: TotalValue, dtype: float64
```

```
# Plotting Total Sales by Region
plt.figure(figsize=(10, 6))
region_sales.plot(kind='bar', color='pink')
plt.title('Total Sales by Region')
plt.xlabel('Region')
plt.ylabel('Total Sales')
plt.show()
```



```
#Top-Selling Product Categories:

#The Electronics category generates the highest revenue, followed by Clothing and Home Decor. This indicates a strong consumer preferen

#High-Value Customers:

#The top 10 customers contribute significantly to total sales. Identifying and nurturing these high-value customers through loyalty prog

#Popular Products:

#Products like ComfortLiving Bluetooth Speaker and ActiveWear Smartphone are the most sold by quantity. These products should be kept we

#Seasonal Sales Trends:

#Sales peak during certain months, particularly in Q4 (October-December). This suggests a seasonal trend, likely driven by holiday shop

#Regional Sales Performance:

#South America and Asia are the top-performing regions in terms of sales. Expanding marketing efforts and inventory in these regions co
#
```

```
from sklearn.preprocessing import StandardScaler
from sklearn.metrics.pairwise import cosine_similarity


# Feature Engineering
# Create customer-product interaction matrix
customer_product_matrix = pd.pivot_table(merged_data, values='Quantity', index='CustomerID', columns='ProductID', fill_value=0)



# Standardize the data
scaler = StandardScaler()
customer_product_matrix_scaled = scaler.fit_transform(customer_product_matrix)


# Calculate cosine similarity between customers
cosine_sim = cosine_similarity(customer_product_matrix_scaled)


# Convert cosine similarity matrix to a DataFrame
cosine_sim_df = pd.DataFrame(cosine_sim, index=customer_product_matrix.index, columns=customer_product_matrix.index)



# Function to get top 3 similar customers
def get_top_similar_customers(customer_id, cosine_sim_df, top_n=3):
```