Import Libraries:

In [ ]:
```
import pandas as pd
import numpy as np
import scipy.stats as sc
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler
import warnings
warnings.filterwarnings("ignore")
import matplotlib.pyplot as plt
```

Import Data:

In [ ]:
```
df = pd.read_excel('database.xlsx')
```

Data Cleaning and Preprocessing:

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

Out[ ]:

	Date	Time	State	Group	Unit	Sales
0	2020-10-01	Morning	WA	Kids	8	20000
1	2020-10-01	Morning	WA	Men	8	20000
2	2020-10-01	Morning	WA	Women	4	10000
3	2020-10-01	Morning	WA	Seniors	15	37500
4	2020-10-01	Afternoon	WA	Kids	3	7500

In [ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7560 entries, 0 to 7559
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Date    7560 non-null   datetime64[ns]
 1   Time    7560 non-null   object
 2   State   7560 non-null   object
 3   Group   7560 non-null   object
 4   Unit    7560 non-null   int64
 5   Sales   7560 non-null   int64
dtypes: datetime64[ns](1), int64(2), object(3)
memory usage: 354.5+ KB
```

In [ ]:
```
df.shape
```

Out[ ]:
```
(7560, 6)
```

In [ ]:
```
df.columns
```

```
Out[ ]: Index(['Date', 'Time', 'State', 'Group', 'Unit', 'Sales'], dtype='object')
```

To ensure that the data is clean and that there is no missing or incorrect data

```
In [ ]: df.isnull().sum()
```

```
Out[ ]: Date     0
        Time     0
        State    0
        Group    0
        Unit     0
        Sales    0
        dtype: int64
```

```
In [ ]: df.describe()
```

Out[ ]:

	Unit	Sales
count	7560.000000	7560.000000
mean	18.005423	45013.558201
std	12.901403	32253.506944
min	2.000000	5000.000000
25%	8.000000	20000.000000
50%	14.000000	35000.000000
75%	26.000000	65000.000000
max	65.000000	162500.000000

```
In [ ]: df['Date'].min()
```

```
Out[ ]: Timestamp('2020-10-01 00:00:00')
```

```
In [ ]: df['Date'].max()
```

```
Out[ ]: Timestamp('2020-12-30 00:00:00')
```

Data normalization:

```
In [ ]: df_numdata = df[['Sales', 'Unit']]
```

```
In [ ]: scaler = MinMaxScaler()
```

```
In [ ]: scaler.fit_transform(df_numdata)
```

```
Out[ ]: array([[0.0952381 , 0.0952381 ],
               [0.0952381 , 0.0952381 ],
               [0.03174603, 0.03174603],
               ...,
               [0.20634921, 0.20634921],
               [0.14285714, 0.14285714],
               [0.17460317, 0.17460317]])
```

Data Analysis:

Descriptive statistical analysis on the data :

```
In [ ]: sales_mean = df['Sales'].mean()
        sales_median = df['Sales'].median()
        sales_mode = df['Sales'].mode().iloc[0]
        sales_std = df['Sales'].std()

        unit_mean = df['Unit'].mean()
        unit_median = df['Unit'].median()
        unit_mode = df['Unit'].mode().iloc[0]
        unit_std = df['Unit'].std()
```

```
In [ ]: # group and calculate total sales for each group
        group_sales = df.groupby('Group')['Sales'].sum()
        highest_sales_group = group_sales.idxmax()
        lowest_sales_group = group_sales.idxmin()
```

```
In [ ]: # Group by 'State' and calculate total sales for each state
        state_sales = df.groupby('State')['Sales'].sum()
        highest_sales_state = state_sales.idxmax()
        lowest_sales_state = state_sales.idxmin()
```

```
In [ ]: # ensure that the date column is in a datetime format
        df['Date'] = pd.to_datetime(df['Date'])
        df.set_index('Date', inplace=True)
```

```
In [ ]: #'resample' function in Pandas to aggregate data based on different time periods

        #Daily report
        Daily_report = df['Sales'].resample('D').sum()
        # Weekly report
        weekly_report = df['Sales'].resample('W').sum()

        # Monthly report
        monthly_report = df['Sales'].resample('M').sum()

        # Quarterly report
        quarterly_report = df['Sales'].resample('Q').sum()


        #print('Daily', Daily_report)
        #print('Monthly', Weekly_report)
        #print('Monthly', monthly_report)
        #print('quarterly', quarterly_report)
```

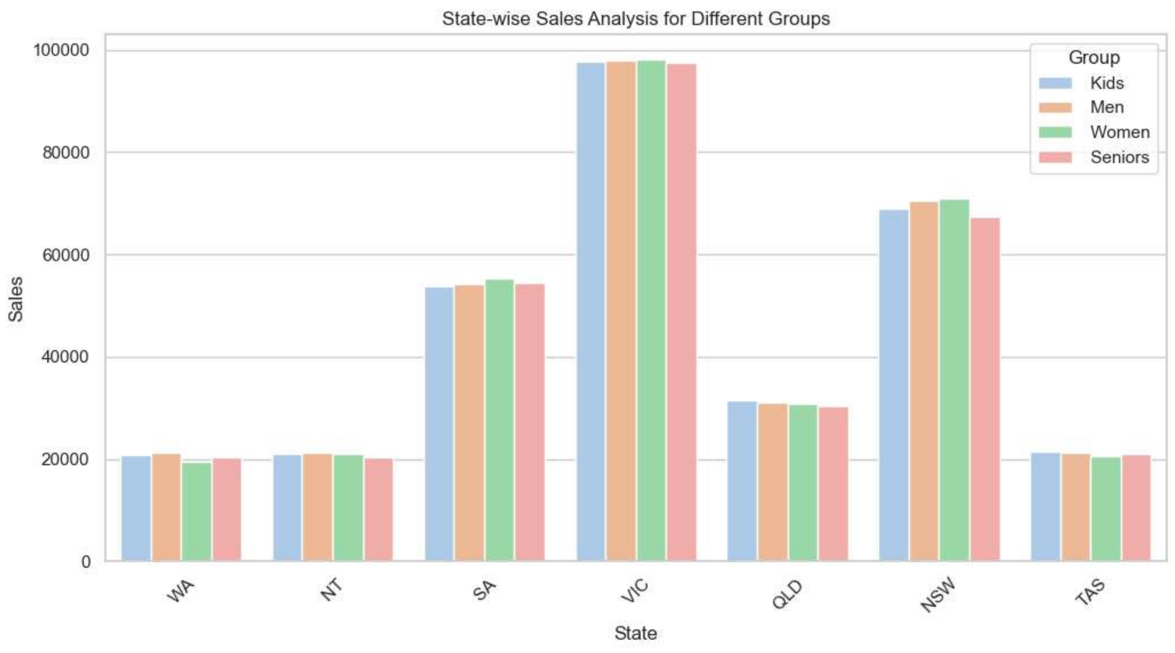
In [ ]:
```
summary_report = f"Sales Statistics:\n\n\
- Mean Sales: {sales_mean:.2f}\n\
- Median Sales: {sales_median:.2f}\n\
- Mode Sales: {sales_mode:.2f}\n\
- Standard Deviation Sales: {sales_std:.2f}\n\
- Mean Unit: {unit_mean:.2f}\n\
- Median Unit: {unit_median:.2f}\n\
- Mode Unit: {unit_mode:.2f}\n\
- Standard Deviation Unit: {unit_std:.2f}\n\n\
Highest Sales Group: {highest_sales_group}\n\
Lowest Sales Group: {lowest_sales_group}\n\n\
Highest Sales State: {highest_sales_state}\n\
Lowest Sales State: {lowest_sales_state}\n"

print(summary_report)
```

```
Sales Statistics:

- Mean Sales: 45013.56
- Median Sales: 35000.00
- Mode Sales: 22500.00
- Standard Deviation Sales: 32253.51
- Mean Unit: 18.01
- Median Unit: 14.00
- Mode Unit: 9.00
- Standard Deviation Unit: 12.90

Highest Sales Group:  Men
Lowest Sales Group:  Seniors

Highest Sales State:  VIC
Lowest Sales State:  WA
```

Data Visualization:

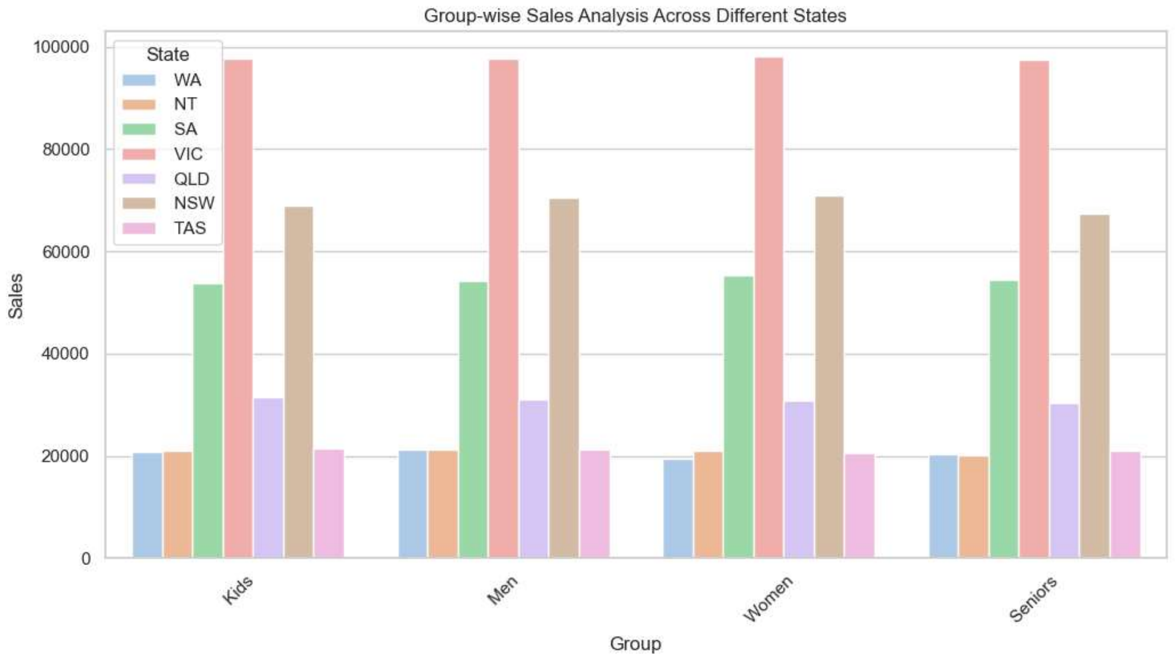
State-wise sales analysis for different groups

In [ ]:
```
# State-wise sales analysis for different groups

plt.figure(figsize=(12, 6))


sns.barplot(x='State', y='Sales', hue='Group', data=df, palette='pastel', ci=Non

plt.title('State-wise Sales Analysis for Different Groups')
plt.xlabel('State')
plt.ylabel('Sales')
plt.xticks(rotation=45)
plt.show()
```



Group-wise sales analysis (kids, women, men, and seniors) across different states.

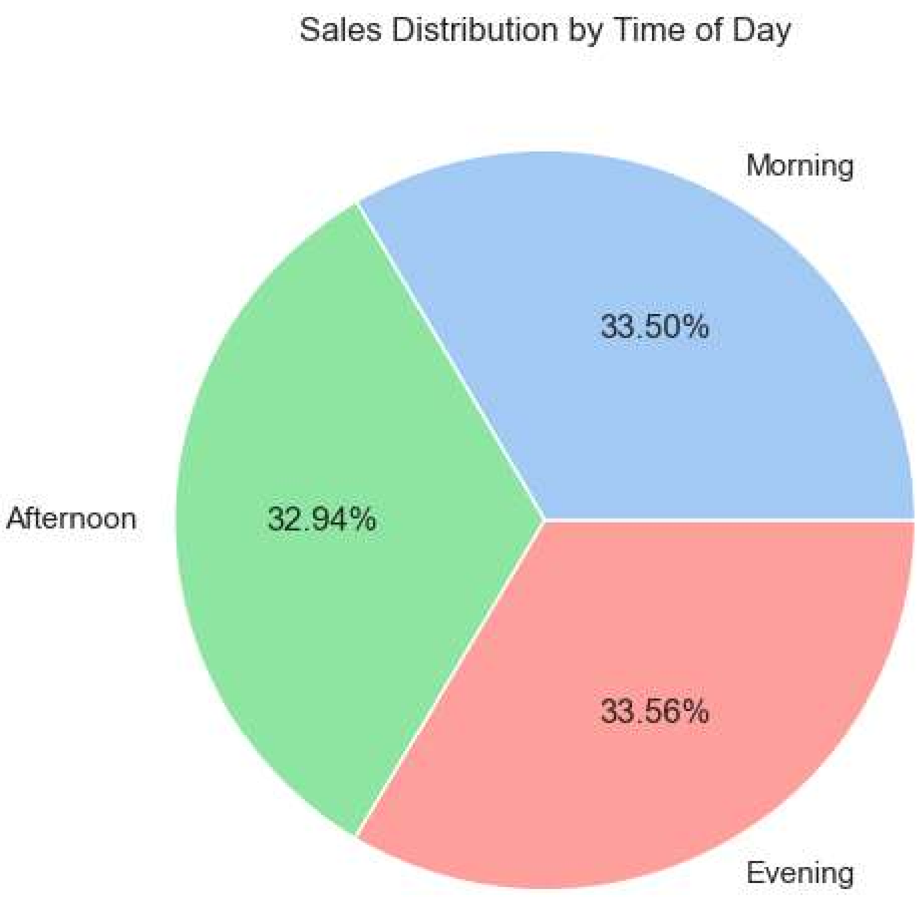
In [ ]:
```
# Group-wise sales analysis across different states
plt.figure(figsize=(12, 6))
sns.barplot(x='Group', y='Sales', hue='State', data=df,ci=None,  palette='pastel
plt.title('Group-wise Sales Analysis Across Different States')
plt.xlabel('Group')
plt.ylabel('Sales')
plt.xticks(rotation=45)
plt.show()
```



Time-of-the-day analysis

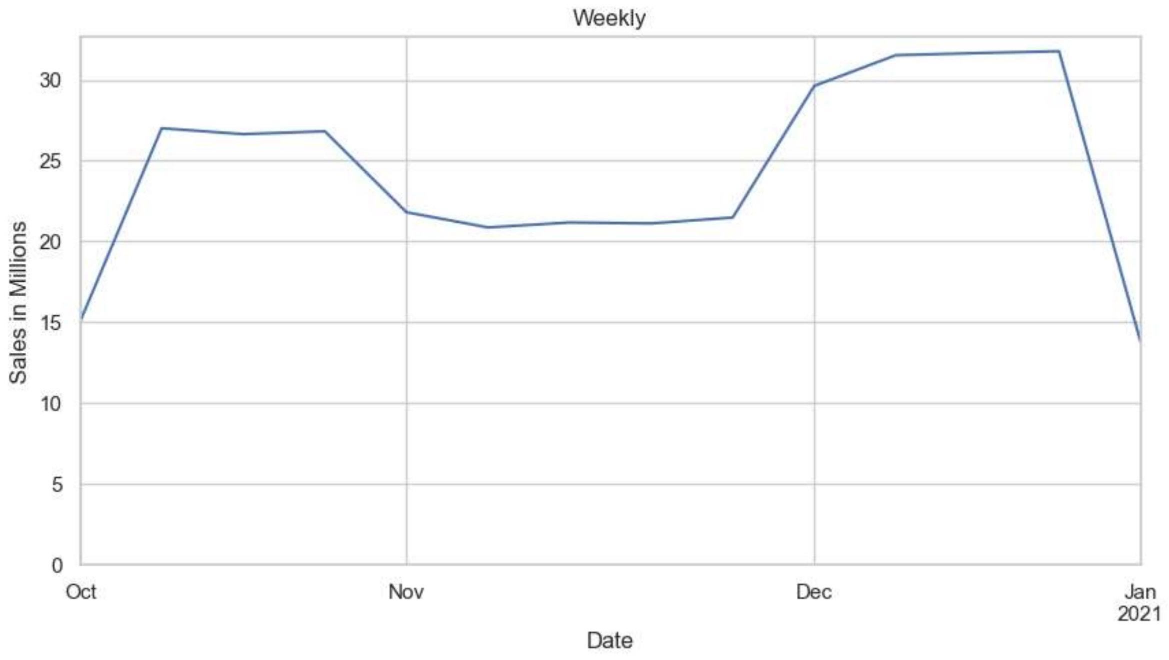
In [ ]:
```
plt.figure(figsize=(12, 6))
dtTime = df.groupby('Time')['Sales'].sum()

colors = ['#a1c9f4', '#8de5a1', '#ff9f9b']
```

```
plt.pie(dtTime, labels=['Morning', 'Afternoon', 'Evening'], autopct='%1.2f%%', c

plt.title('Sales Distribution by Time of Day')
plt.show()
```

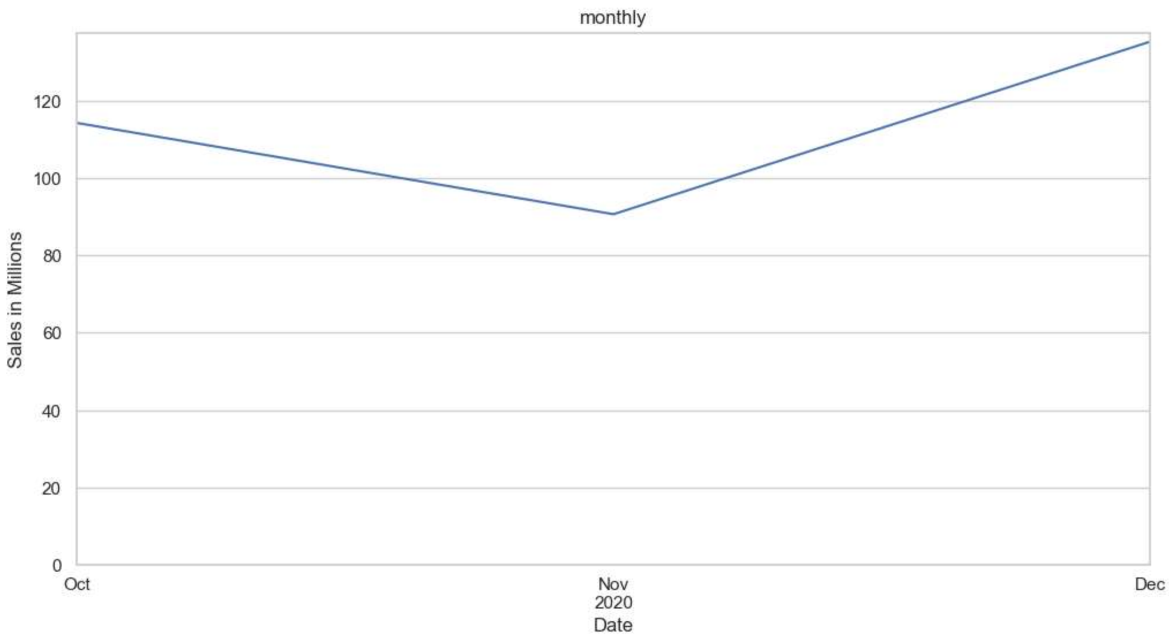


In [ ]:

```
# Group-wise sales analysis across different states
plt.figure(figsize=(10, 5))
w = weekly_report
w = w.div(1000000)
plot = w.plot(title='Weekly',ylim=0,ylabel="Sales in Millions")

plot.yaxis.get_major_formatter().set_scientific(False)

plt.show()
```



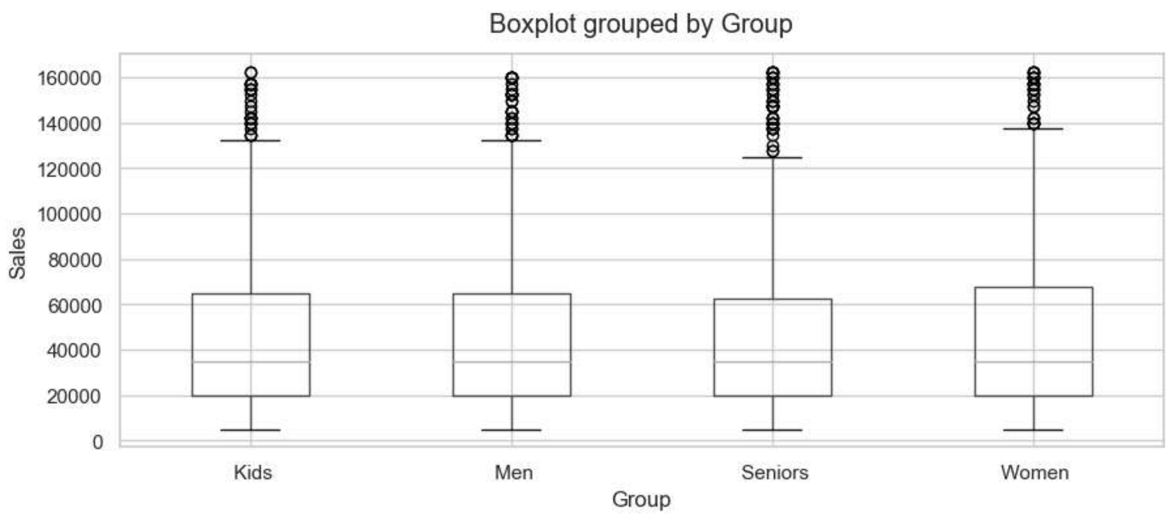
In [ ]:
```
plt.figure(figsize=(12, 6))
w = monthly_report
w = w.div(1000000)
plot = w.plot(title='monthly',ylim=0,ylabel="Sales in Millions")

plot.yaxis.get_major_formatter().set_scientific(False)

plt.show()
```



BoxPlot :

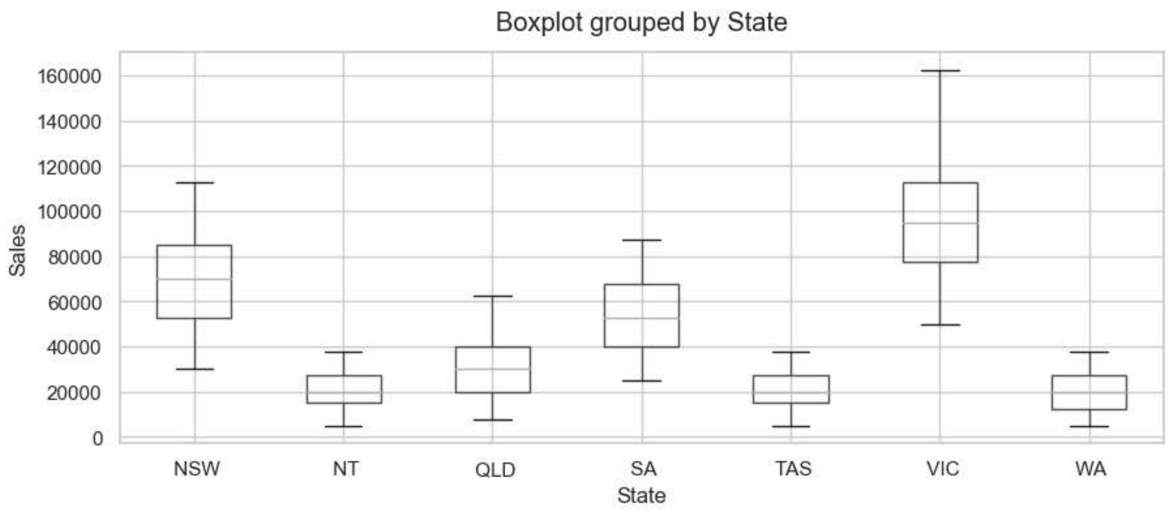
In [ ]:
```
ax = df.boxplot(column='Sales', by='Group', figsize=(10, 4))
ax.set_ylabel('Sales')
ax.set_title('')
```

Out[ ]:
```
Text(0.5, 1.0, '')
```



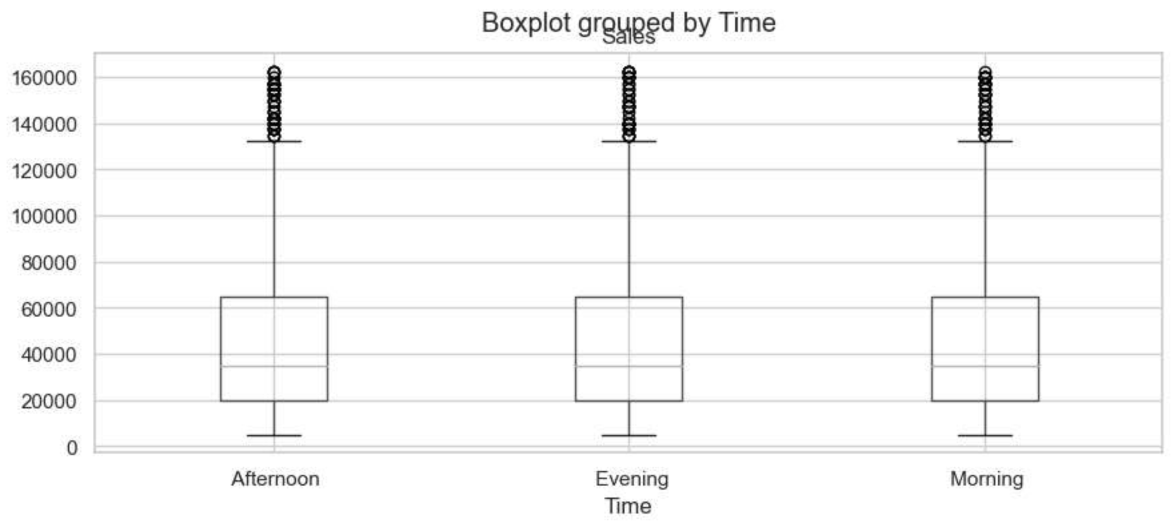
In [ ]:
```
ax = df.boxplot(column='Sales', by='State', figsize=(10, 4))
ax.set_ylabel('Sales')
ax.set_title('')
```

Out[ ]:
```
Text(0.5, 1.0, '')
```



In [ ]:
```
uax = df.boxplot(column='Sales', by='Time', figsize=(10, 4))
ax.set_ylabel('Sales')
ax.set_title('')
```

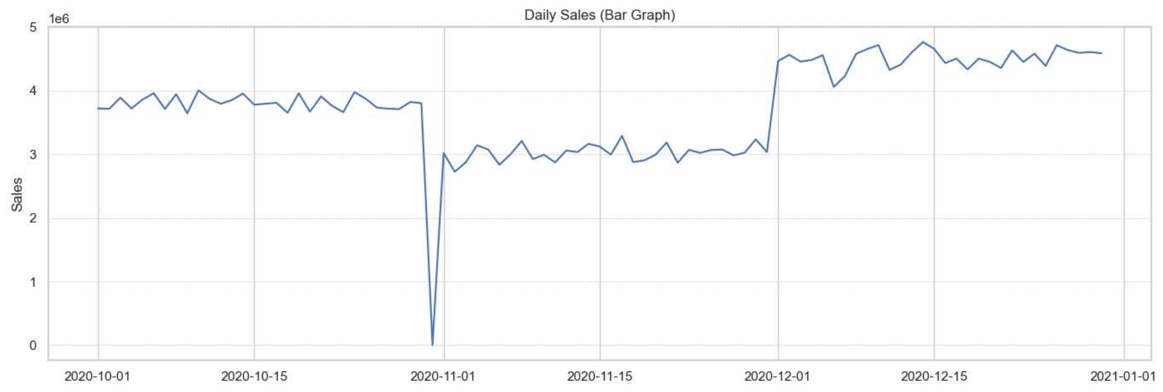
Out[ ]:
```
Text(0.5, 1.0, '')
```

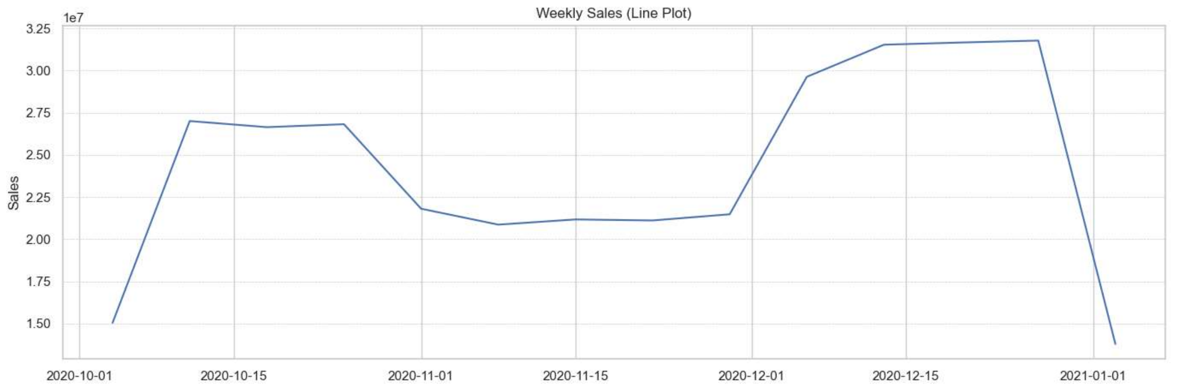


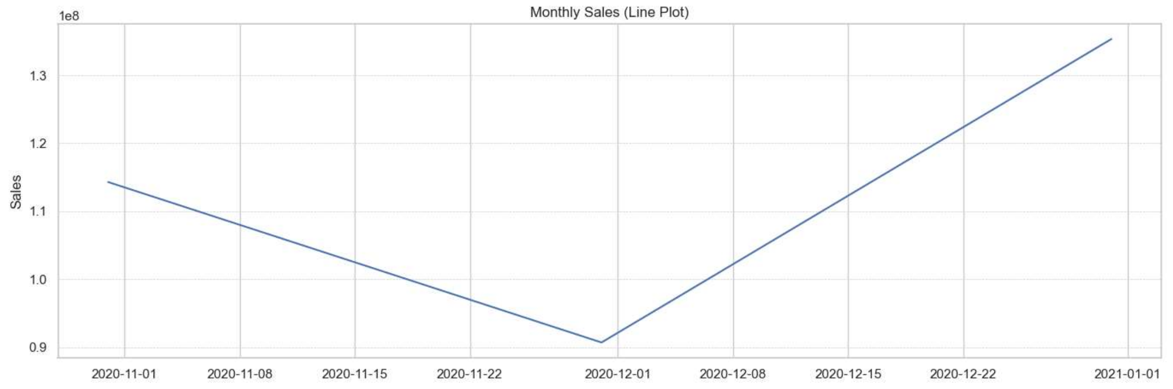
DashBoard:

In [ ]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Create a dashboard with daily, weekly, and monthly charts
sns.set(style="whitegrid")


fig, axes = plt.subplots(nrows=3, ncols=1, figsize=(14, 15))  # Changed nrows to
fig.suptitle("Sales Dashboard", fontsize=17)

# Daily Chart (Bar Graph)
daily_data = df.resample('D').sum()  # Resample by day
sns.lineplot(x=daily_data.index, y=daily_data['Sales'], ax=axes[0], color='b')
axes[0].set_title('Daily Sales (Bar Graph)')
axes[0].set_xlabel('')
axes[0].set_ylabel('Sales')
axes[0].grid(axis='y', linestyle='--', linewidth=0.5)

# Weekly Chart (Line Plot)
weekly_data = df.resample('W').sum()
sns.lineplot(x=weekly_data.index, y=weekly_data['Sales'], ax=axes[1], color='b')
axes[1].set_title('Weekly Sales (Line Plot)')
axes[1].set_xlabel('')
axes[1].set_ylabel('Sales')
axes[1].grid(axis='y', linestyle='--', linewidth=0.5)

# Monthly Chart (Line Plot)
monthly_data = df.resample('M').sum()
sns.lineplot(x=monthly_data.index, y=monthly_data['Sales'], ax=axes[2], color='b
axes[2].set_title('Monthly Sales (Line Plot)')
axes[2].set_xlabel('')
axes[2].set_ylabel('Sales')
axes[2].grid(axis='y', linestyle='--', linewidth=0.5)


fig.tight_layout(rect=[0, 0, 1, 0.95])

# Show the dashboard
plt.show()
```

Sales Dashboard


Daily Sales (Bar Graph)
1e6
Sales


Weekly Sales (Line Plot)
1e7
Sales


Monthly Sales (Line Plot)
1e8
Sales