Titanic EDA Project

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Metadata

- **Project: EDA on Titanic Dataset**
- **Dataset: Titanic (Seaborn Built-in)**
- **Tools: Python, Jupyter Notebook, Pandas, NumPy, Matplotlib, Seaborn, Plotly, ydata_profiling**
- **Skills Covered: Data Cleaning, EDA, Feature Engineering, Visualization, Normalization, Standardization**

In [197]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
from sklearn.preprocessing import LabelEncoder, StandardScaler, MinMaxScaler
import ydata_profiling
%matplotlib inline
sns.set_style('whitegrid')
```

Load Titanic Dataset & Save to CSV

In [198]:

```
# Load dataset from seaborn
df = sns.load_dataset('titanic')

# Save as CSV in the current folder
df.to_csv('titanic.csv', index=False)

import warnings
warnings.filterwarnings('ignore')   # Ignore all warnings
```

Load Titanic Dataset from CSV

In [199]:

```
# Load the CSV file (now using saved CSV)
df = pd.read_csv('titanic.csv')
df.head()
```

Out[199]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alo
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	Fa

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alo
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	Fa
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	Tr
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	Fa
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	Tr

Dataset Overview

In [200]:

```
# Check the shape of the dataset
print("Dataset shape:", df.shape)

# Check first 5 rows
df.head()
```

```
Dataset shape: (891, 15)
```

Out[200]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alo
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	Fa
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	Fa
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	Tr
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	Fa
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	Tr

Dataset Info

In [201]:

```
# Check column names, data types, and non-null counts
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   survived     891 non-null    int64  
 1   pclass       891 non-null    int64  
 2   sex          891 non-null    object 
 3   age          714 non-null    float64
 4   sibsp        891 non-null    int64  
 5   parch        891 non-null    int64  
 6   fare         891 non-null    float64
 7   embarked     889 non-null    object 
 8   class        891 non-null    object 
 9   who          891 non-null    object 
 10  adult_male   891 non-null    bool   
 11  deck         203 non-null    object 
 12  embark_town  889 non-null    object 
 13  alive        891 non-null    object 
 14  alone        891 non-null    bool   
dtypes: bool(2), float64(2), int64(4), object(7)
memory usage: 92.4+ KB
```

Summary Statistics

Check Missing Values

In [202]:

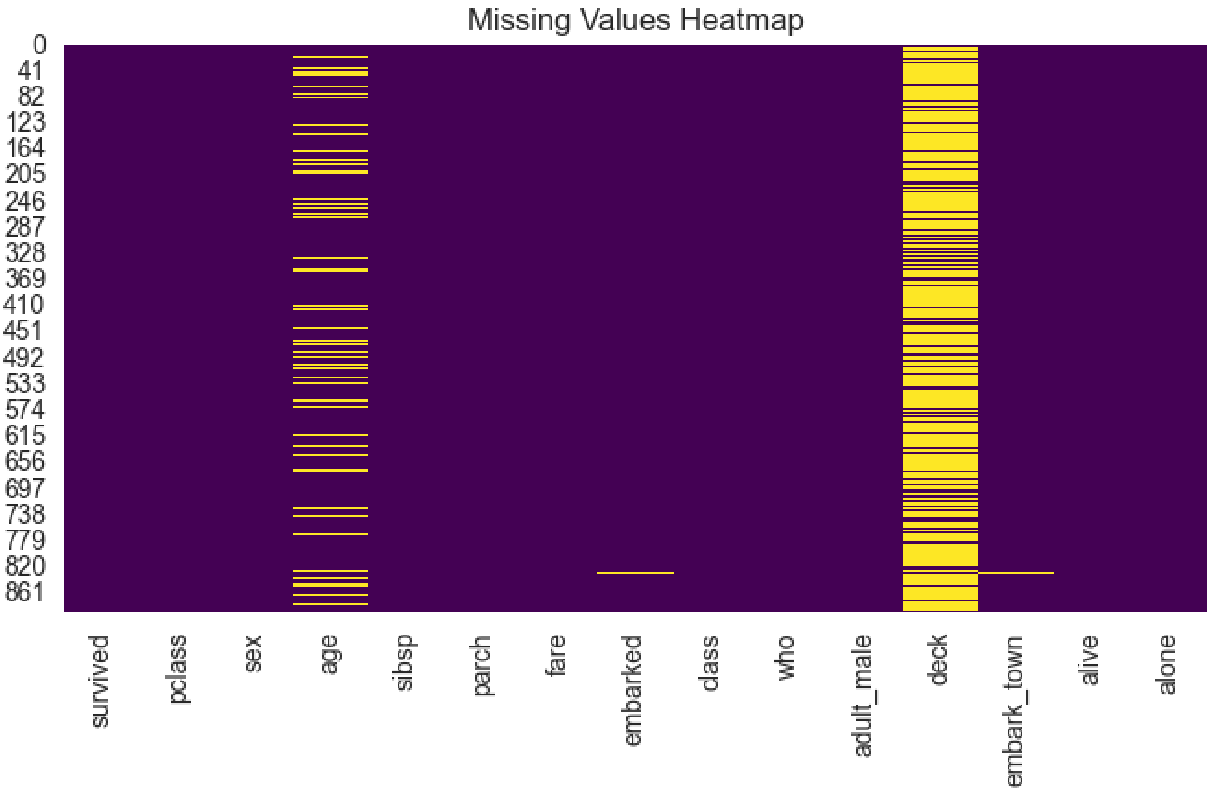
```
# Count of missing values per column
missing = df.isnull().sum()
missing[missing > 0]   # Show only columns with missing values
```

Out[202]:

```
age            177
embarked         2
deck           688
embark_town      2
dtype: int64
```

In [203]:

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

plt.figure(figsize=(8,4))
sns.heatmap(df.isnull(), cbar=False, cmap='viridis')
plt.title("Missing Values Heatmap")
plt.show()
```



Handling Missing Values

Handling strategy:

- **'age' → fill with median**
- **'embarked' → fill with mode (most frequent port)**
- **'embark_town' → fill with mode**
- **'deck' → fill with 'Unknown' category**

In [204]:

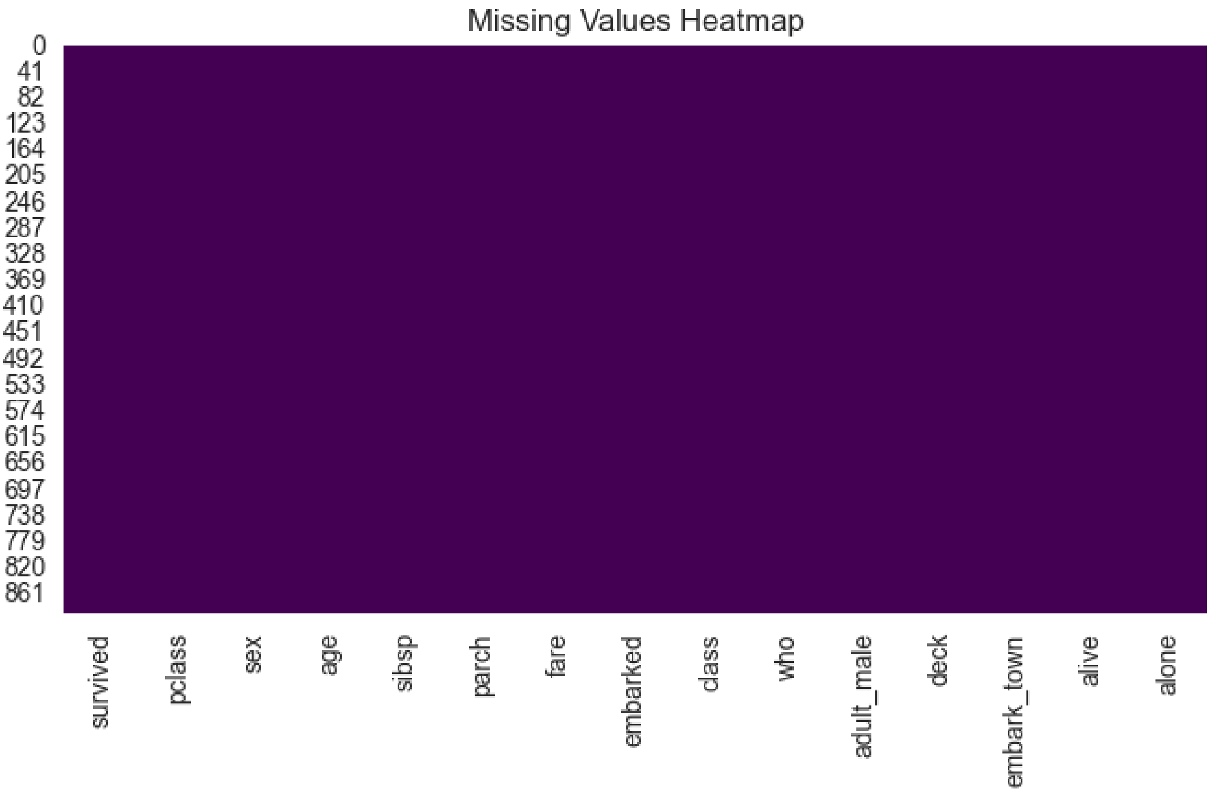
```
df['age'] = df['age'].fillna(df['age'].median())
df['embarked'] = df['embarked'].fillna(df['embarked'].mode()[0])
df['embark_town'] = df['embark_town'].fillna(df['embark_town'].mode()[0])
df['deck'] = df['deck'].fillna('Unknown')
```

```
# Check missing values after handling
missing_after = df.isnull().sum()
print("Missing values after handling:")
print(missing_after[missing_after > 0])
```

```
Missing values after handling:
Series([], dtype: int64)
```

In [205]:

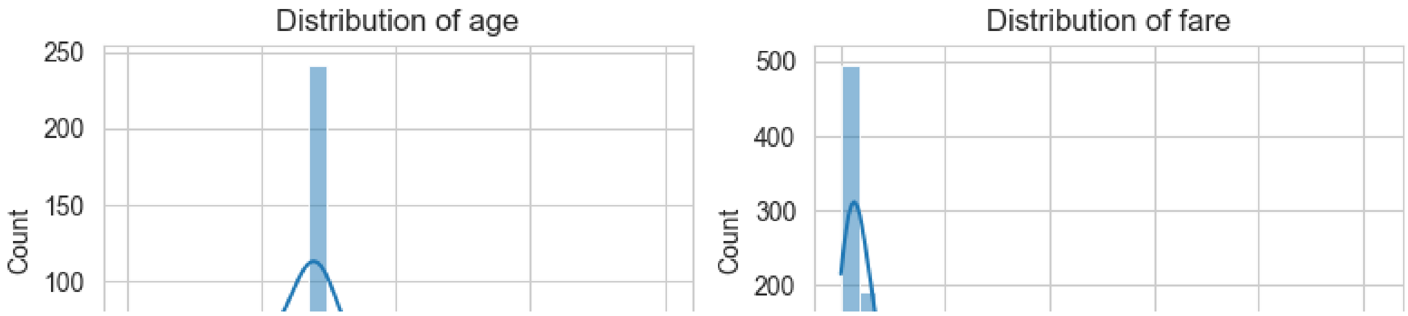
```
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(8,4))
sns.heatmap(df.isnull(), cbar=False, cmap='viridis')
plt.title("Missing Values Heatmap")
plt.show()
```

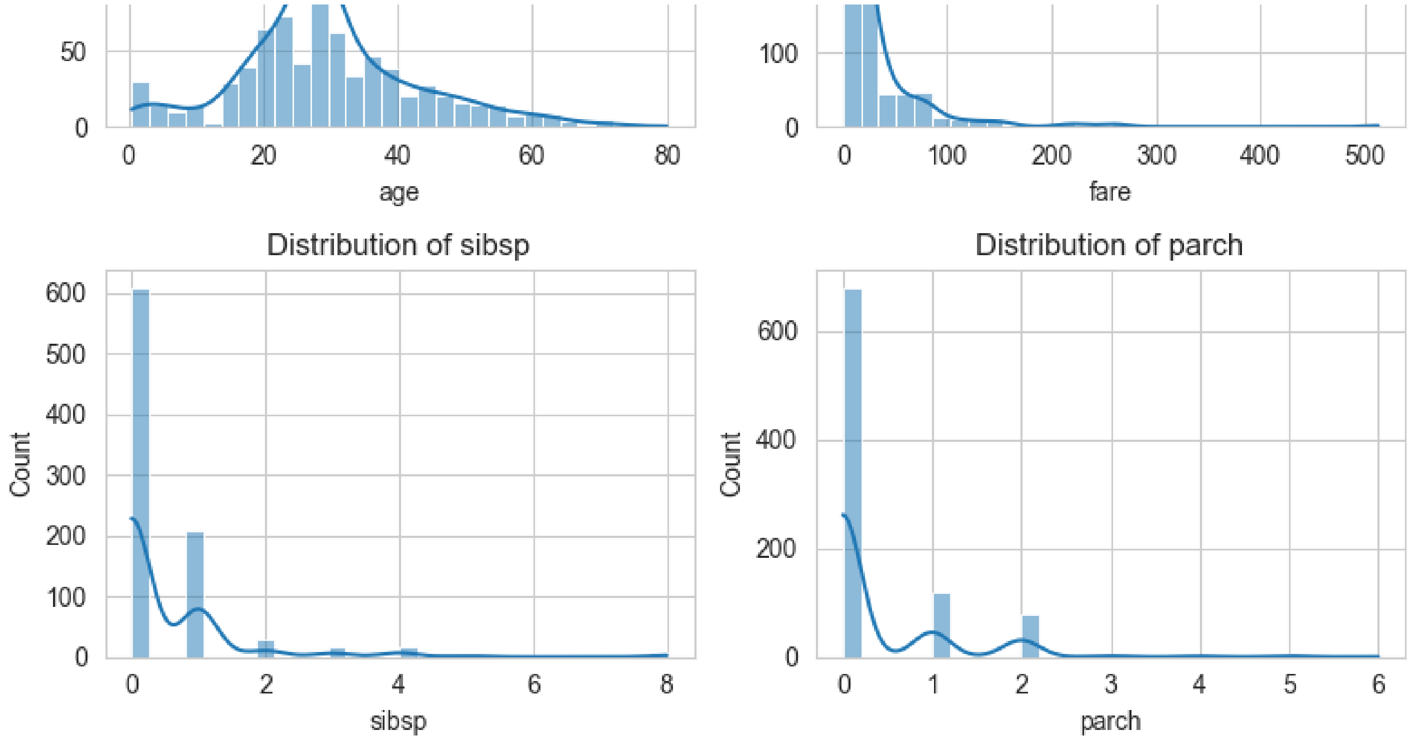


Visualize Numerical Features

In [206]:

```
num_cols = ['age', 'fare', 'sibsp', 'parch']

plt.figure(figsize=(8,6))
for i, col in enumerate(num_cols):
    plt.subplot(2,2,i+1)
    sns.histplot(df[col], kde=True, bins=30)
    plt.title(f'Distribution of {col}')
plt.tight_layout()
plt.show()
```

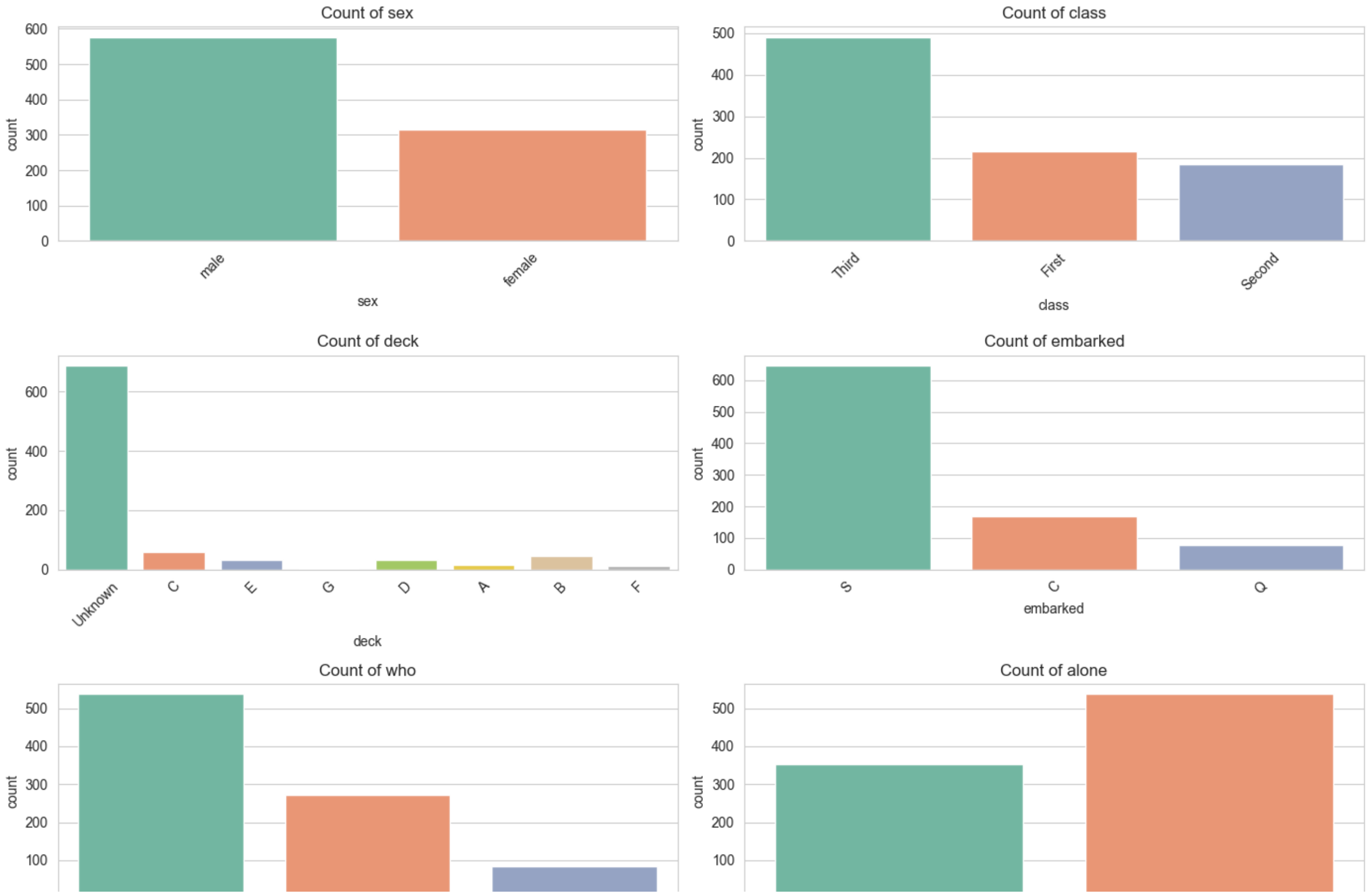




Visualize Categorical Features

In [207]:

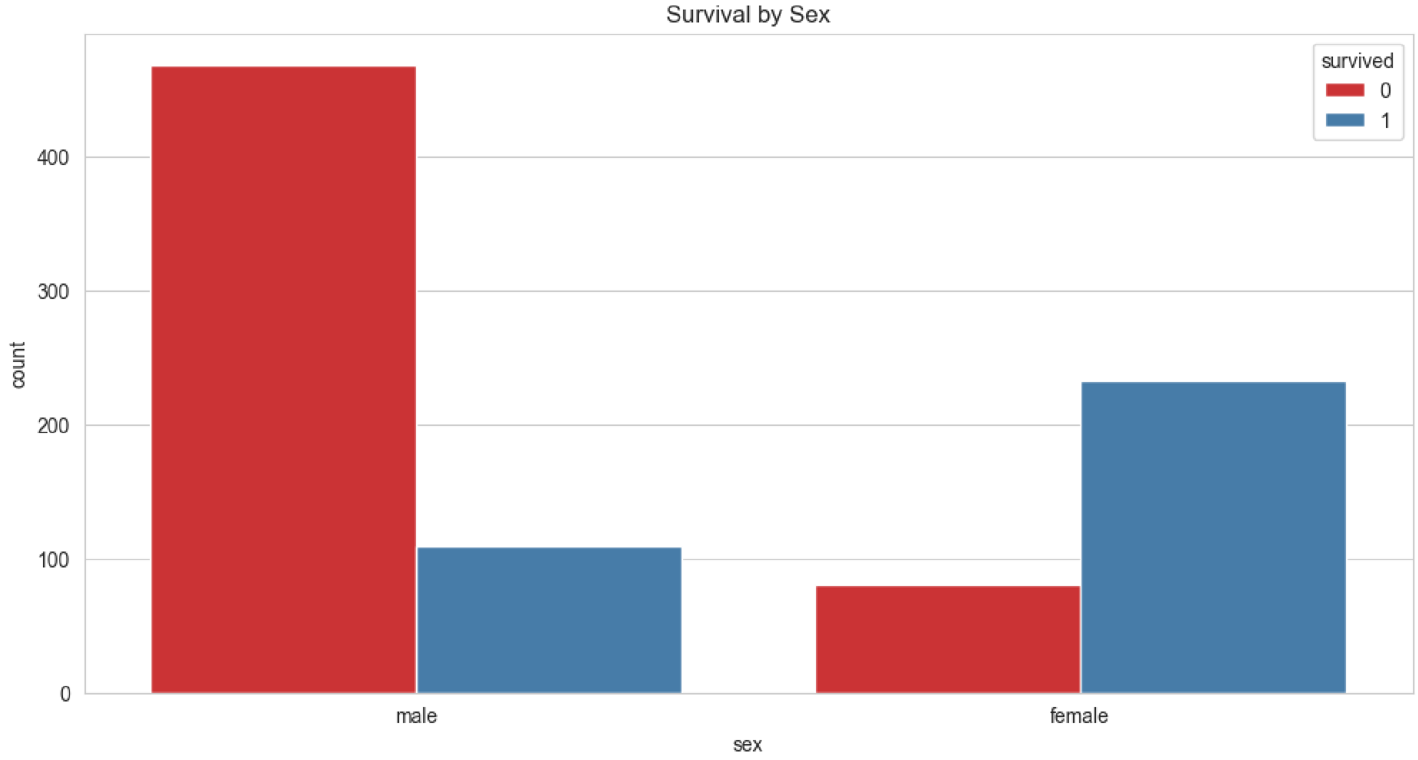
```
cat_cols = ['sex', 'class', 'deck', 'embarked', 'who', 'alone']

plt.figure(figsize=(14,10))
for i, col in enumerate(cat_cols):
    plt.subplot(3,2,i+1)
    sns.countplot(data=df, x=col, palette='Set2')
    plt.title(f'Count of {col}')
    plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



Survival Analysis by Category

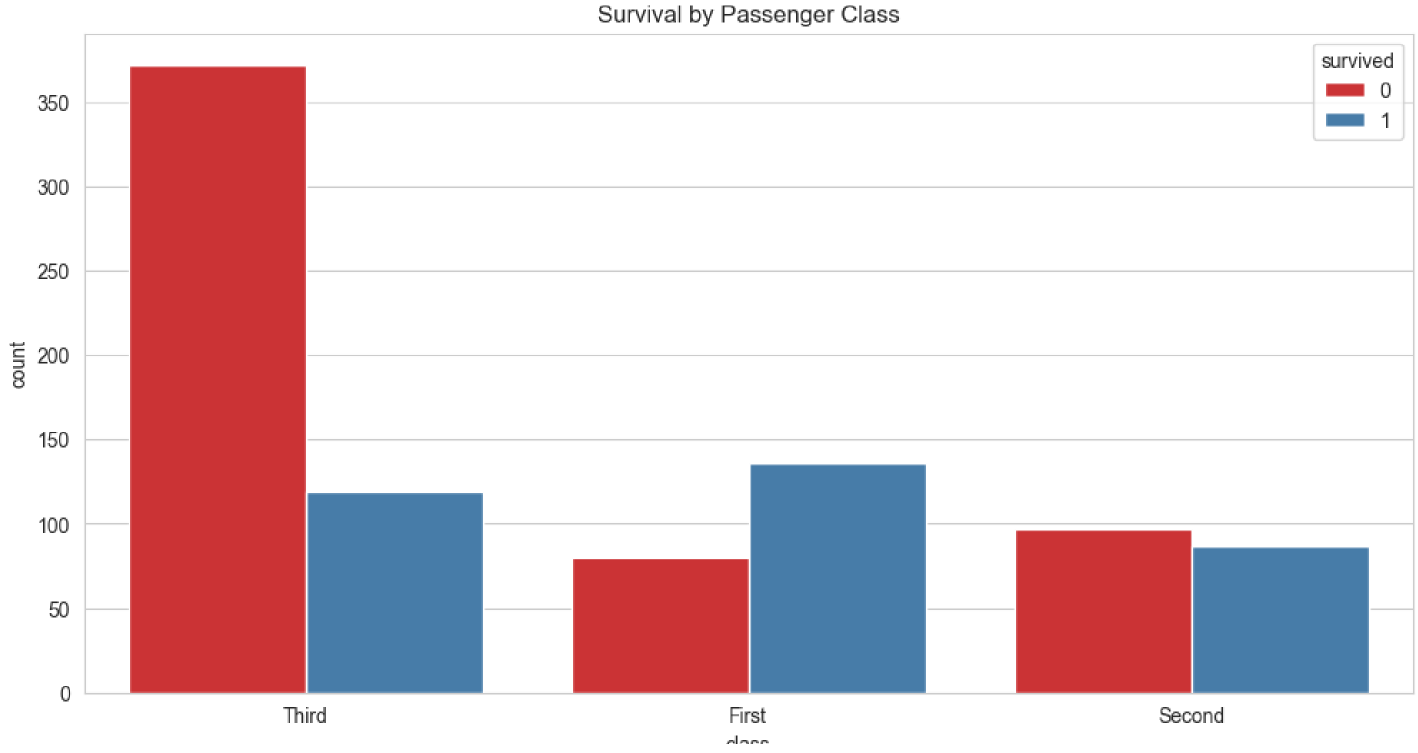
In [208]:

```
plt.figure(figsize=(12,6))
sns.countplot(data=df, x='sex', hue='survived', palette='Set1')
plt.title('Survival by Sex')
plt.show()
```



In [209]:

```
plt.figure(figsize=(12,6))
sns.countplot(data=df, x='class', hue='survived', palette='Set1')
plt.title('Survival by Passenger Class')
plt.show()
```

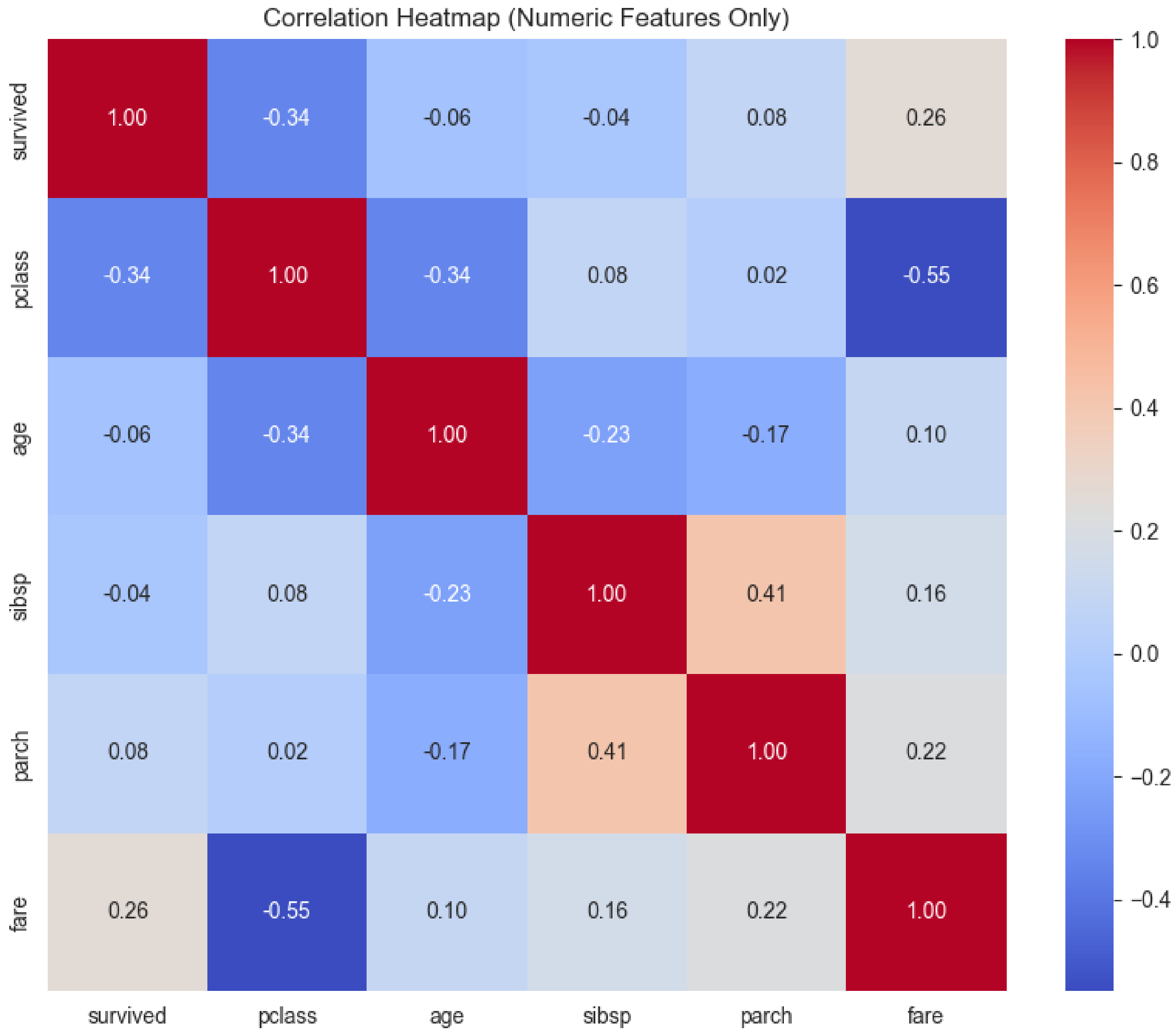


class

Correlation Heatmap

In [210]:

```
# Select numeric columns only
numeric_df = df.select_dtypes(include=['int64', 'float64'])

plt.figure(figsize=(10,8))
sns.heatmap(numeric_df.corr(), annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Heatmap (Numeric Features Only)')
plt.show()
```



Check duplicates

In [211]:

```
df.duplicated().sum()
```

Out[211]:

```
110
```

Handle duplicates

In [212]:

```
df = df.drop_duplicates()
df.duplicated().sum()
```

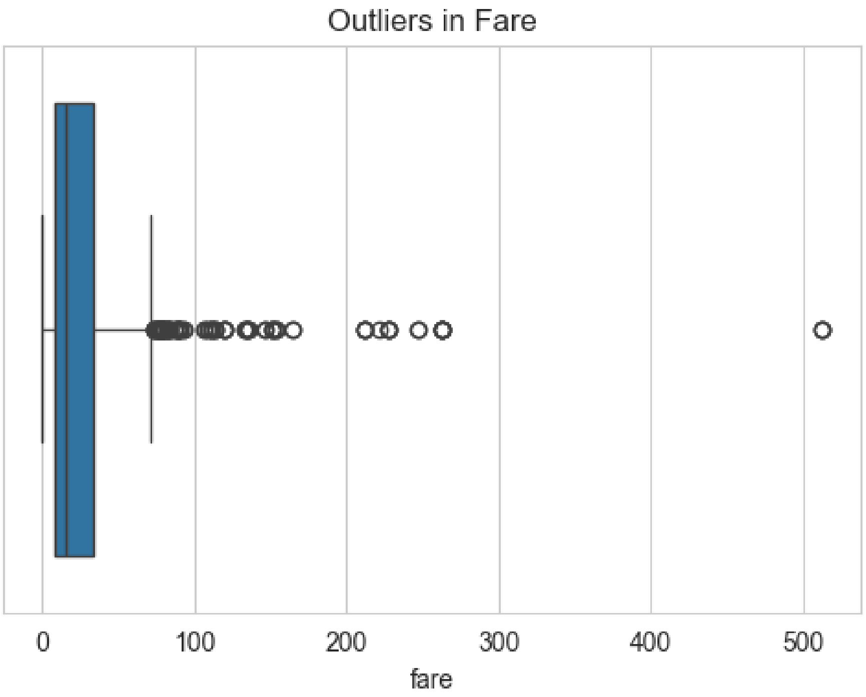
Out[212]:

```
0
```

Check Outliers

In [213]:

```
plt.figure(figsize=(6,4))
sns.boxplot(x=df['fare'])
plt.title("Outliers in Fare")
plt.show()
```



In [214]:

```
Q1 = df['fare'].quantile(0.25)
Q3 = df['fare'].quantile(0.75)
IQR = Q3 - Q1

lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

outliers = df[(df['fare'] < lower_bound) | (df['fare'] > upper_bound)]
outliers.shape
```

Out[214]:

```
(102, 15)
```

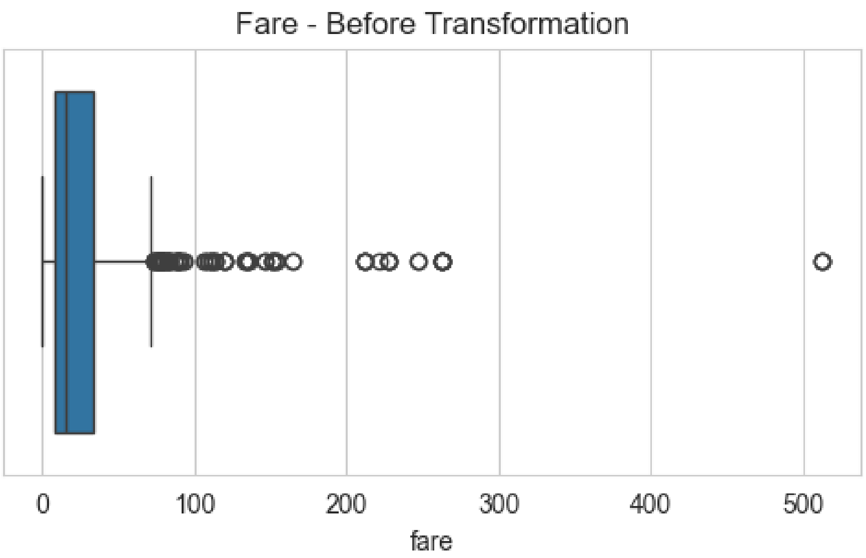
In [215]:

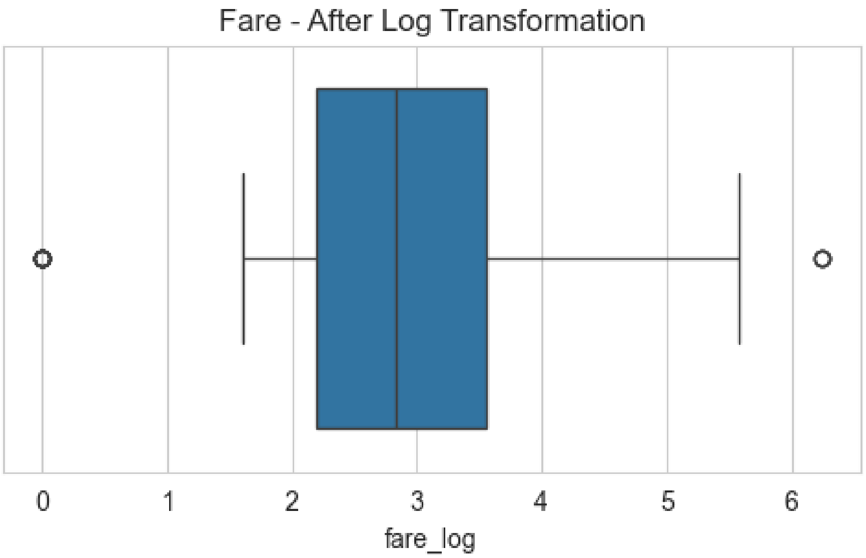
```
df['fare_log'] = np.log1p(df['fare'])
```

In [216]:

```
plt.figure(figsize=(6,3))
sns.boxplot(x=df['fare'])
plt.title("Fare - Before Transformation")
plt.show()

plt.figure(figsize=(6,3))
```

```
sns.boxplot(x=df['fare_log'])
plt.title("Fare - After Log Transformation")
plt.show()
```





Encoding

In [217]:

```
df.select_dtypes(include='object').columns
```

Out[217]:

```
Index(['sex', 'embarked', 'class', 'who', 'deck', 'embark_town', 'alive'], dtype='object'
)
```

In [218]:

```
df['sex'] = df['sex'].map({'male': 0, 'female': 1})
df = pd.get_dummies(df, columns=['embarked'], drop_first=True)
df.head()
```

Out[218]:

	survived	pclass	sex	age	sibsp	parch	fare	class	who	adult_male	deck	embark_town	alive	alone	fare_l
0	0	3	0	22.0	1	0	7.2500	Third	man	True	Unknown	Southampton	no	False	2.1102
1	1	1	1	38.0	1	0	71.2833	First	woman	False	C	Cherbourg	yes	False	4.2805
2	1	3	1	26.0	0	0	7.9250	Third	woman	False	Unknown	Southampton	yes	True	2.1888
3	1	1	1	35.0	1	0	53.1000	First	woman	False	C	Southampton	yes	False	3.9908

	survived	pclass	sex	age	sibsp	parch	fare	class	who	adult_male	deck	embark_town	alive	alone	fare_l
4	0	3	0	35.0	0	0	8.0500	Third	man	True	Unknown	Southampton	no	True	2.2027

In [219]:

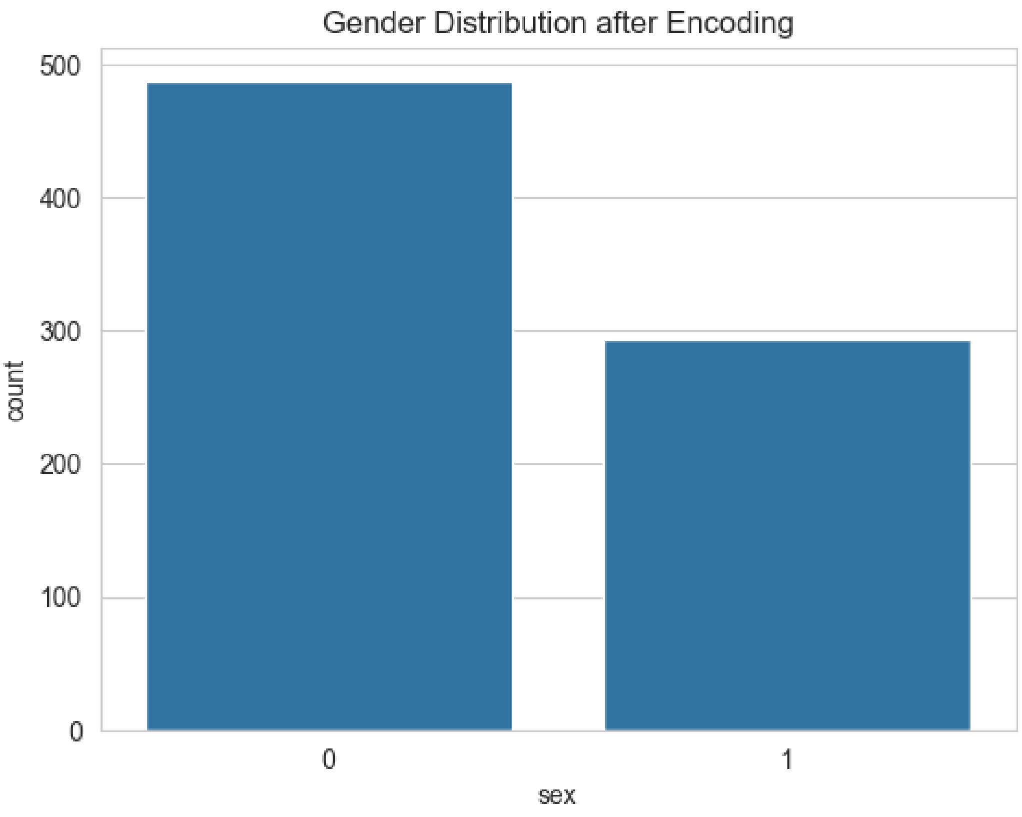
```
df.shape
```

Out[219]:

```
(781, 17)
```

In [220]:

```
sns.countplot(x='sex', data=df)
plt.title('Gender Distribution after Encoding')
plt.show()
```



Y-data Profiling

In [221]:

```
from ydata_profiling import ProfileReport
# Create profile report
profile = ProfileReport(df, title="Titanic Dataset Profiling Report", explorative=True)
# Save report as HTML
profile.to_file("titanic_EDA_report.html")
```

In [222]:

```
df.to_csv('titanic_updated.csv', index=False)

print("Updated dataset saved as 'titanic_updated.csv'. Original 'titanic.csv' remains unchanged.")
```

```
Updated dataset saved as 'titanic_updated.csv'. Original 'titanic.csv' remains unchanged.
```