In [1]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [2]:
```
import pandas as pd

file_path = '/content/drive/MyDrive/train.csv'

df = pd.read_csv(file_path)
```

In [3]:
```
df.head()
```

Out[3]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Ca
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	

In [4]:
```
df.tail()
```

Out[4]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00	NaN
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45	NaN
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00	C148
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75	NaN

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

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

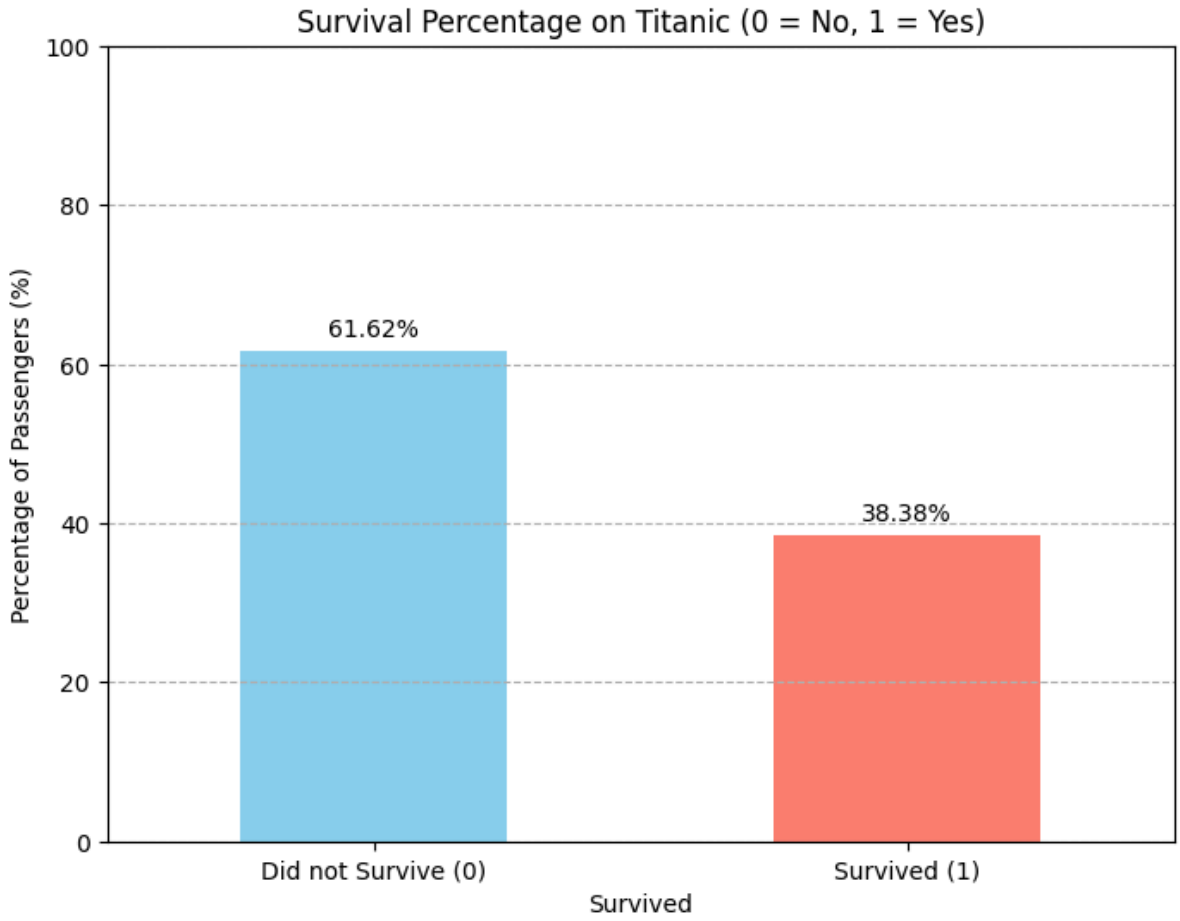
Out[6]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

Percentage of Survivors vs. Non-Survivors

In [7]:
```
import pandas as pd
import matplotlib.pyplot as plt

df = pd.read_csv(file_path)

print("\nPercentage of Survivors vs. Non-Survivors:")
survival_percentages = df['Survived'].value_counts(normalize=True) * 100
print(survival_percentages)

plt.figure(figsize=(8, 6))
ax = survival_percentages.plot(kind='bar', color=['skyblue', 'salmon'])
plt.title('Survival Percentage on Titanic (0 = No, 1 = Yes)')
plt.xlabel('Survived')
plt.ylabel('Percentage of Passengers (%)')
plt.xticks(ticks=[0, 1], labels=['Did not Survive (0)', 'Survived (1)'], rot
plt.ylim(0, 100)
plt.grid(axis='y', linestyle='--')

for p in ax.patches:
    ax.annotate(f"{p.get_height():.2f}%", (p.get_x() + p.get_width() / 2., p
                ha='center', va='center', xytext=(0, 9), textcoords='offset
plt.show()
```

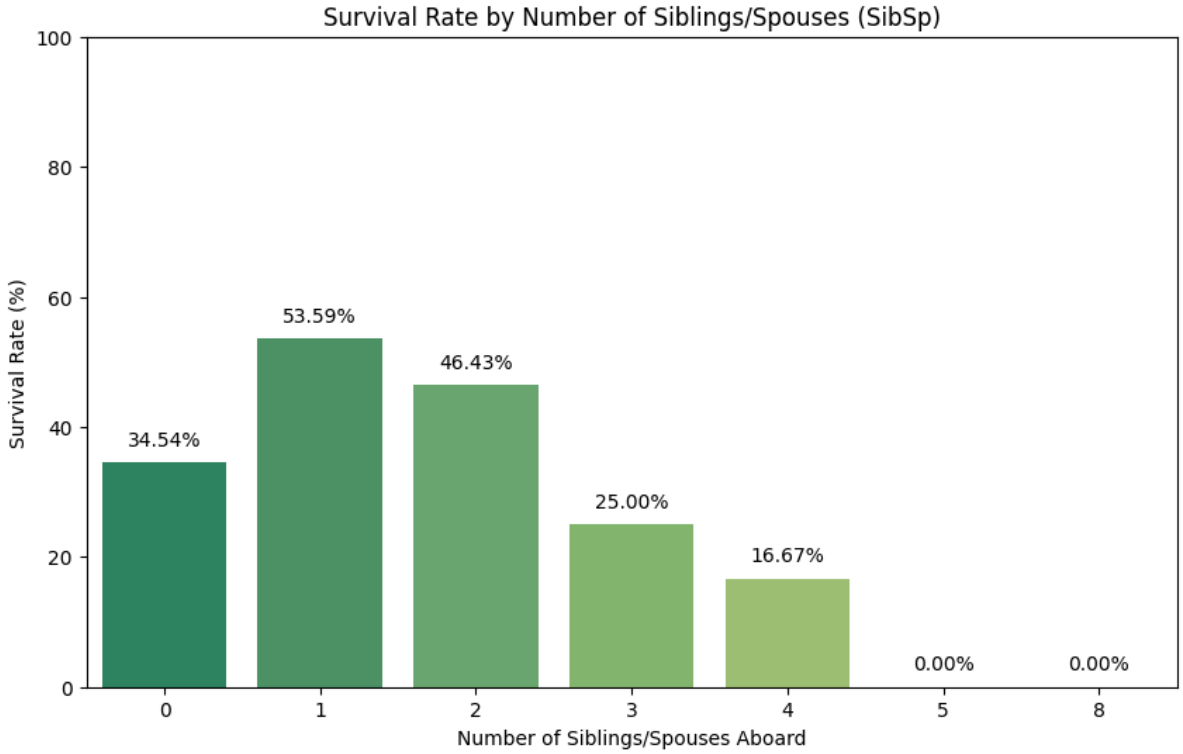
```
Percentage of Survivors vs. Non-Survivors:
Survived
0    61.616162
1    38.383838
Name: proportion, dtype: float64
```



In [8]:
```
import seaborn as sns
survival_rate_sibsp = df.groupby('SibSp')['Survived'].mean() * 100 # Multipl
print("Survival Rate by SibSp:\n", survival_rate_sibsp)

# Plotting with Seaborn
plt.figure(figsize=(10, 6))
ax_sibsp = sns.barplot(x=survival_rate_sibsp.index, y=survival_rate_sibsp.va
plt.title('Survival Rate by Number of Siblings/Spouses (SibSp)')
plt.xlabel('Number of Siblings/Spouses Aboard')
plt.ylabel('Survival Rate (%)')
plt.ylim(0, 100) # Set y-axis limit for percentages

# Add percentage text on top of bars
for i, v in enumerate(survival_rate_sibsp.values):
    ax_sibsp.text(i, v + 2, f"{v:.2f}%", color='black', ha='center', va='bot

plt.show()
```

```
Survival Rate by SibSp:
 SibSp
0    34.539474
1    53.588517
2    46.428571
3    25.000000
4    16.666667
5     0.000000
8     0.000000
Name: Survived, dtype: float64
```

```
<ipython-input-8-dabb4964be1d>:7: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  ax_sibsp = sns.barplot(x=survival_rate_sibsp.index, y=survival_rate_sibsp.values, palette='summer')
```



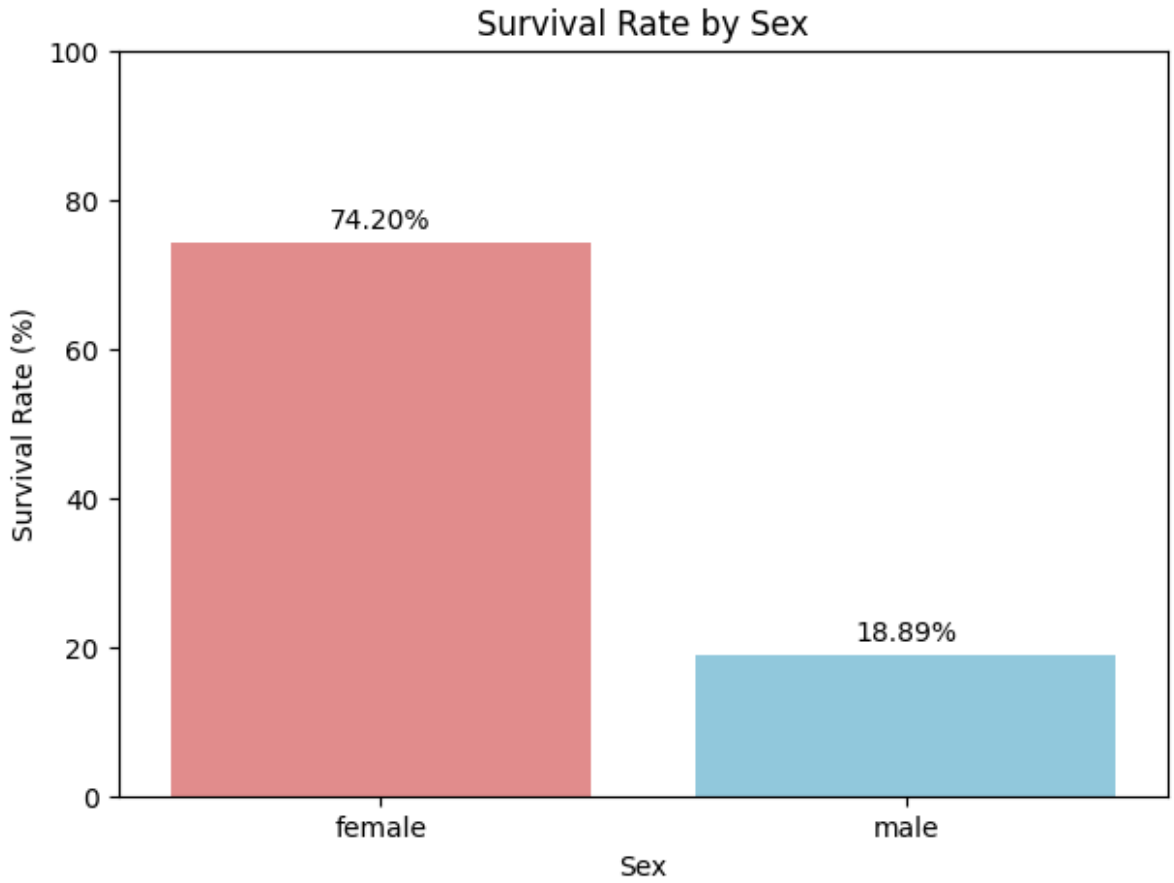
Survival Rate by 'Sex'

In [9]:
```
import seaborn as sns

survival_rate_sex = df.groupby('Sex')['Survived'].mean() * 100  # .mean() gi
print("Survival Rate by Sex:\n", survival_rate_sex)

# Plotting with Seaborn
plt.figure(figsize=(7, 5))
ax = sns.barplot(x=survival_rate_sex.index, y=survival_rate_sex.values, pale
plt.title('Survival Rate by Sex')
plt.ylabel('Survival Rate (%)')
```

```
plt.xlabel('Sex')
plt.ylim(0, 100)

for i, v in enumerate(survival_rate_sex.values):
    ax.text(i, v + 2, f"{v:.2f}%", color='black', ha='center')

plt.show()
```

```
Survival Rate by Sex:
 Sex
female    74.203822
male      18.890815
Name: Survived, dtype: float64
```

```
<ipython-input-9-1bfc9b93faf7>:9: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed
in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the
same effect.

  ax = sns.barplot(x=survival_rate_sex.index, y=survival_rate_sex.values, pa
lette=['lightcoral', 'skyblue'])
```

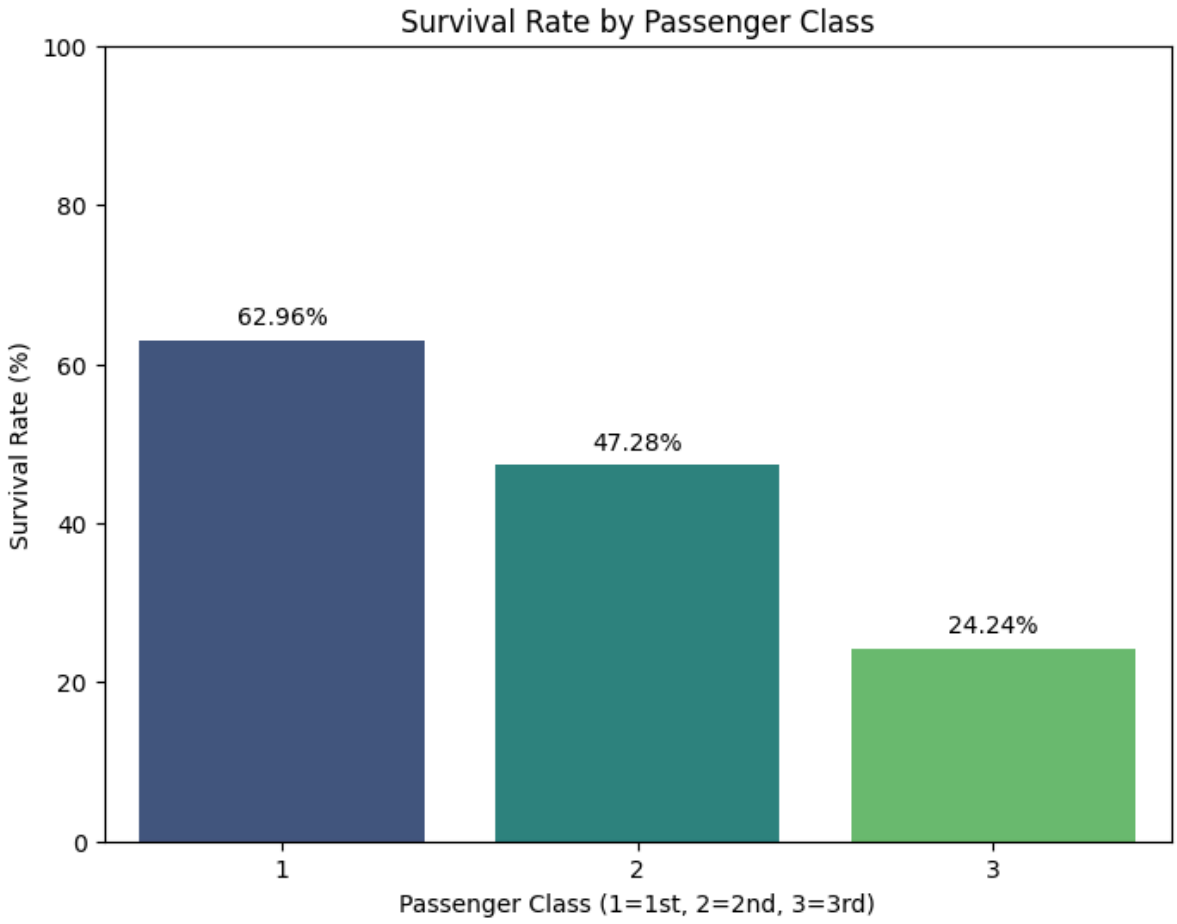


Survival Rate by 'Pclass' (Passenger Class)

In [10]:
```
# Calculate survival rate by Pclass
survival_rate_pclass = df.groupby('Pclass')['Survived'].mean() * 100
print("\nSurvival Rate by Passenger Class:\n", survival_rate_pclass)

# Plotting
plt.figure(figsize=(8, 6))
ax = sns.barplot(x=survival_rate_pclass.index, y=survival_rate_pclass.values
plt.title('Survival Rate by Passenger Class')
plt.ylabel('Survival Rate (%)')
plt.xlabel('Passenger Class (1=1st, 2=2nd, 3=3rd)')
plt.ylim(0, 100)

# Add percentage text on top of bars
for i, v in enumerate(survival_rate_pclass.values):
    ax.text(i, v + 2, f"{v:.2f}%", color='black', ha='center')

plt.show()
```

```
Survival Rate by Passenger Class:
 Pclass
1    62.962963
2    47.282609
3    24.236253
Name: Survived, dtype: float64
```

```
<ipython-input-10-5390c3fc3e21>:7: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed
in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the
same effect.

  ax = sns.barplot(x=survival_rate_pclass.index, y=survival_rate_pclass.valu
es, palette='viridis')
```

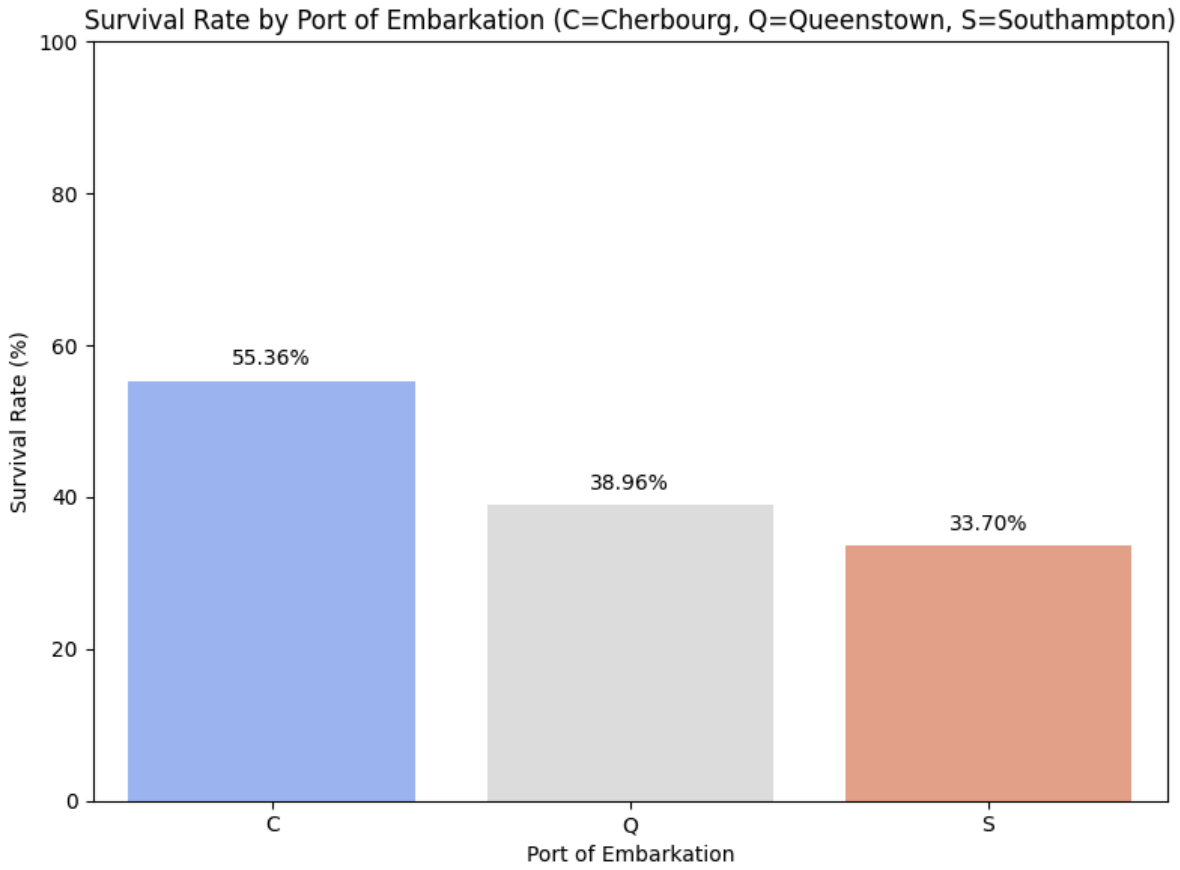


Survival Rate by 'Embarked' (Port of Embarkation)

In [11]:
```
# Calculate survival rate by Embarked
survival_rate_embarked = df.groupby('Embarked')['Survived'].mean() * 100
print("\nSurvival Rate by Port of Embarkation:\n", survival_rate_embarked)

# Plotting
plt.figure(figsize=(8, 6))
ax = sns.barplot(x=survival_rate_embarked.index, y=survival_rate_embarked.va
plt.title('Survival Rate by Port of Embarkation (C=Cherbourg, Q=Queenstown,
plt.ylabel('Survival Rate (%)')
plt.xlabel('Port of Embarkation')
plt.ylim(0, 100)
plt.tight_layout()
# Add percentage text on top of bars
for i, v in enumerate(survival_rate_embarked.values):
    ax.text(i, v + 2, f"{v:.2f}%", color='black', ha='center')

plt.show()
```

```
Survival Rate by Port of Embarkation:
 Embarked
C    55.357143
Q    38.961039
S    33.695652
Name: Survived, dtype: float64
```

```
<ipython-input-11-97f75a6bc37e>:7: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  ax = sns.barplot(x=survival_rate_embarked.index, y=survival_rate_embarked.values, palette='coolwarm')
```



In [12]:
```python
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

# --- 1. Age Distribution by Survival ---

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

# Using Seaborn's histplot
sns.histplot(data=df, x='Age', hue='Survived', multiple='stack', kde=False,
plt.title('Age Distribution by Survival (Stacked Histogram)')
plt.xlabel('Age')
plt.ylabel('Number of Passengers')
```

```
plt.legend(title='Survived', labels=['Yes (1)', 'No (0)'])
plt.tight_layout()
plt.show()

plt.figure(figsize=(12, 6))
# Using Seaborn's kdeplot (Kernel Density Estimate for smooth distributions)
sns.kdeplot(data=df.dropna(subset=['Age']), x='Age', hue='Survived', fill=Tr
plt.title('Age Distribution by Survival (Density Plot)')
plt.xlabel('Age')
plt.ylabel('Density')
plt.tight_layout()
plt.show()

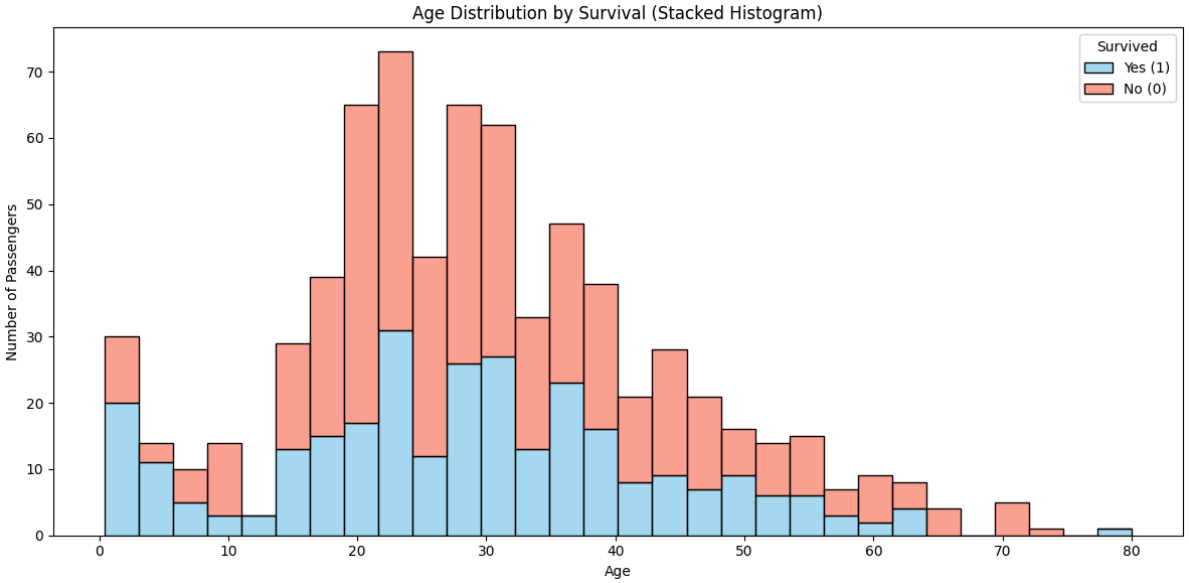
# --- 2. Fare Distribution by Survival ---

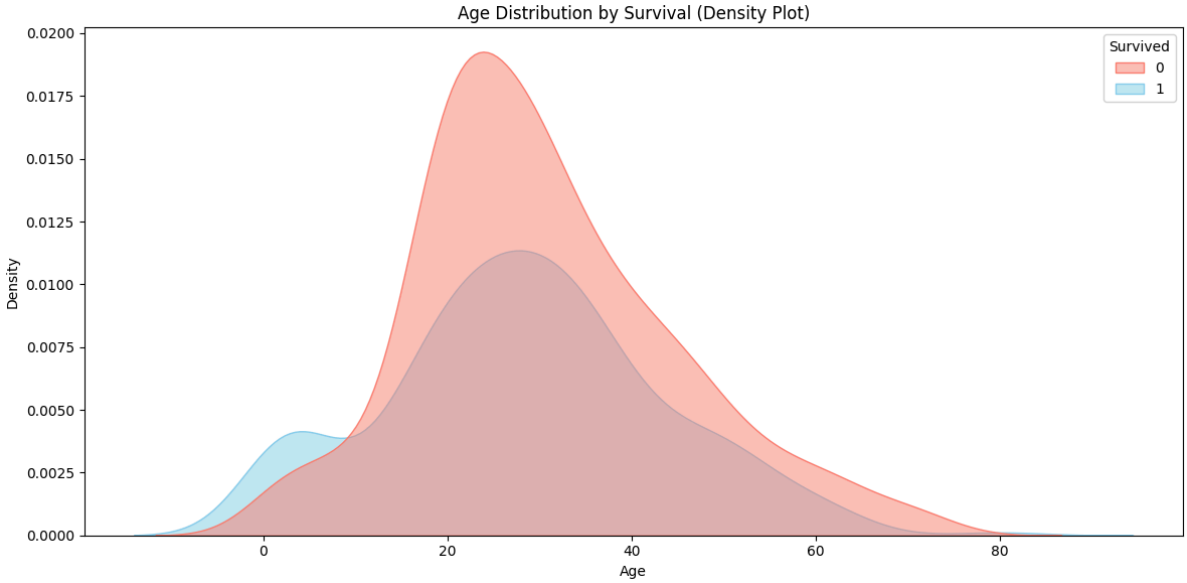
plt.figure(figsize=(12, 6))

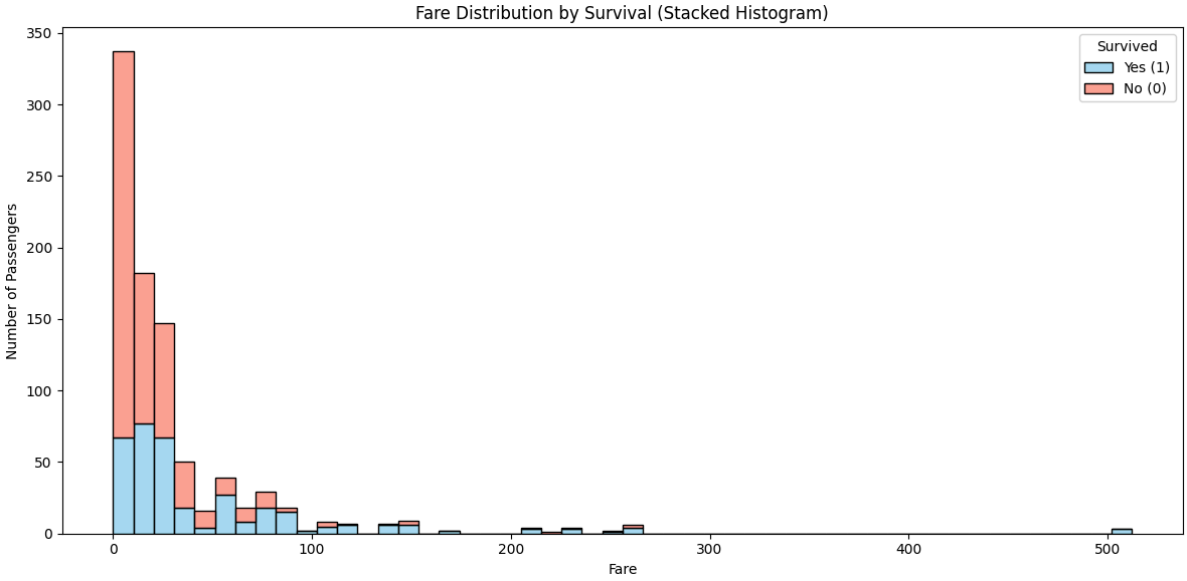
# Histplot for Fare (Stacked)
sns.histplot(data=df, x='Fare', hue='Survived', multiple='stack', kde=False,
plt.title('Fare Distribution by Survival (Stacked Histogram)')
plt.xlabel('Fare')
plt.ylabel('Number of Passengers')
plt.legend(title='Survived', labels=['Yes (1)', 'No (0)'])
plt.tight_layout()
plt.show()

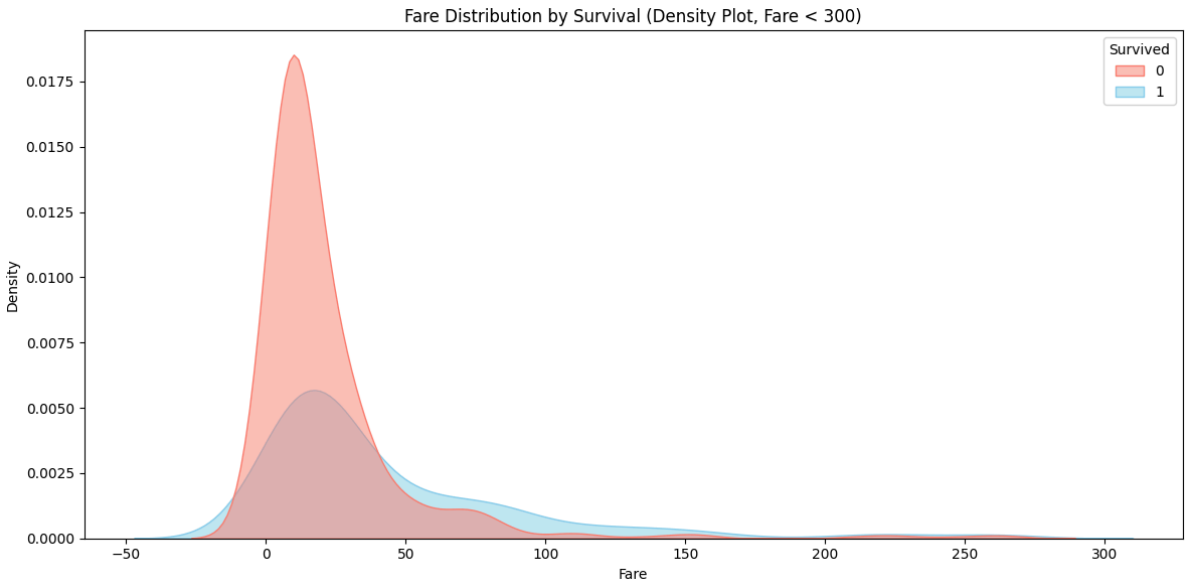

plt.figure(figsize=(12, 6))

# KDE plot for Fare
sns.kdeplot(data=df[df['Fare'] < 300], x='Fare', hue='Survived', fill=True,
plt.title('Fare Distribution by Survival (Density Plot, Fare < 300)')
plt.xlabel('Fare')
plt.ylabel('Density')
plt.tight_layout()
plt.show()
```









Missing Values

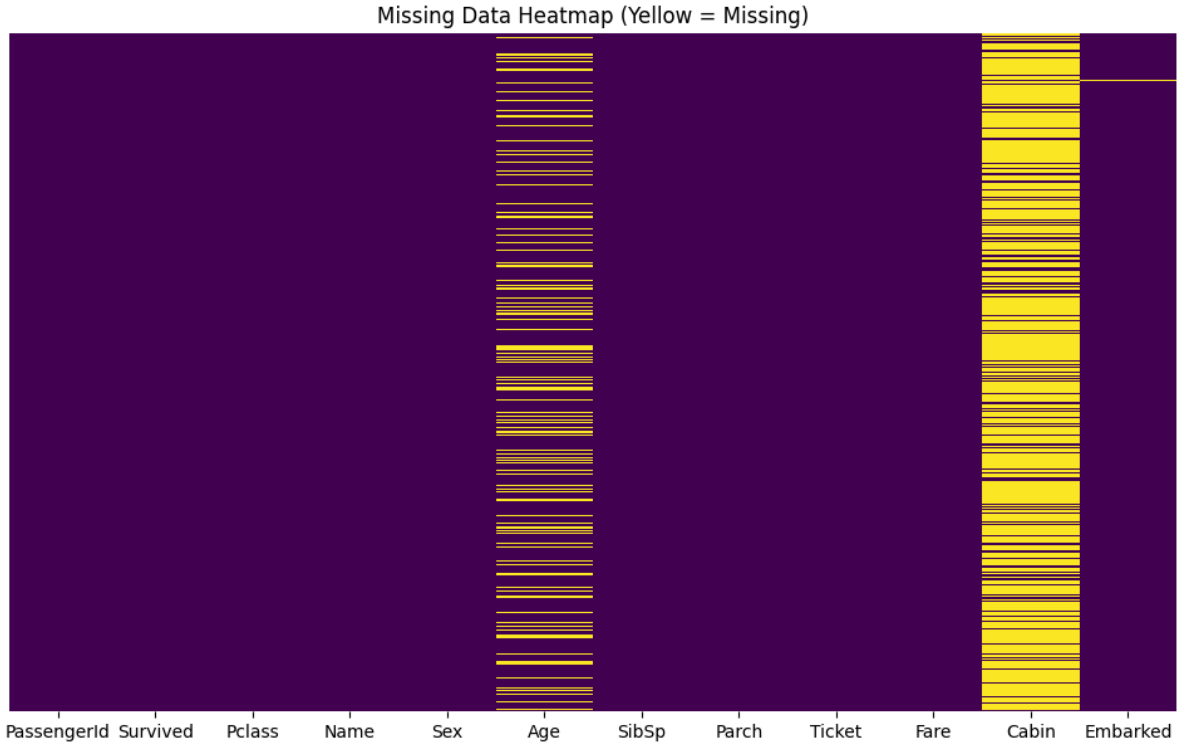
In [13]:
```
# --- Count missing values in each column ---
missing_counts = df.isnull().sum()
print("Missing Value Counts per Column:")
print(missing_counts[missing_counts > 0]) # Show only columns with missing v

# --- Calculate percentage of missing values in each column ---
total_rows = len(df)
missing_percentages = (df.isnull().sum() / total_rows) * 100
print("\nMissing Value Percentages per Column:")
print(missing_percentages[missing_percentages > 0].sort_values(ascending=Fal

# --- Heatmap using Seaborn ---
plt.figure(figsize=(12, 7))
sns.heatmap(df.isnull(), yticklabels=False, cbar=False, cmap='viridis')
plt.title('Missing Data Heatmap (Yellow = Missing)')
plt.show()
```

```
Missing Value Counts per Column:
Age         177
Cabin       687
Embarked      2
dtype: int64

Missing Value Percentages per Column:
Cabin       77.104377
Age         19.865320
Embarked     0.224467
dtype: float64
```



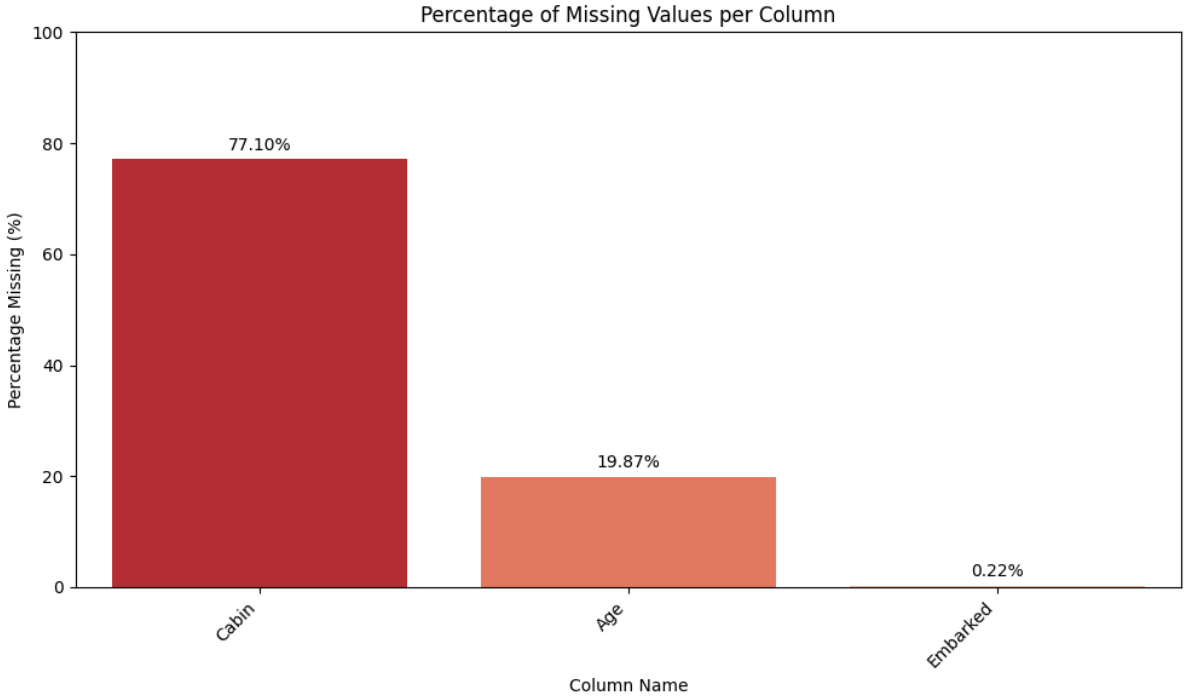
In [14]:
```
plt.figure(figsize=(10, 6))
missing_to_plot = missing_percentages[missing_percentages > 0].sort_values(a
sns.barplot(x=missing_to_plot.index, y=missing_to_plot.values, palette='Reds
```

```
plt.xticks(rotation=45, ha='right')
plt.title('Percentage of Missing Values per Column')
plt.ylabel('Percentage Missing (%)')
plt.xlabel('Column Name')
plt.ylim(0, 100)
# Adding percentage text on top of bars
for i, v in enumerate(missing_to_plot.values):
    plt.text(i, v + 1, f"{v:.2f}%", color='black', ha='center', va='bottom')
plt.tight_layout()
plt.show()
```

```
<ipython-input-14-6639a216134c>:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed
in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the
same effect.

  sns.barplot(x=missing_to_plot.index, y=missing_to_plot.values, palette='Re
ds_r')
```

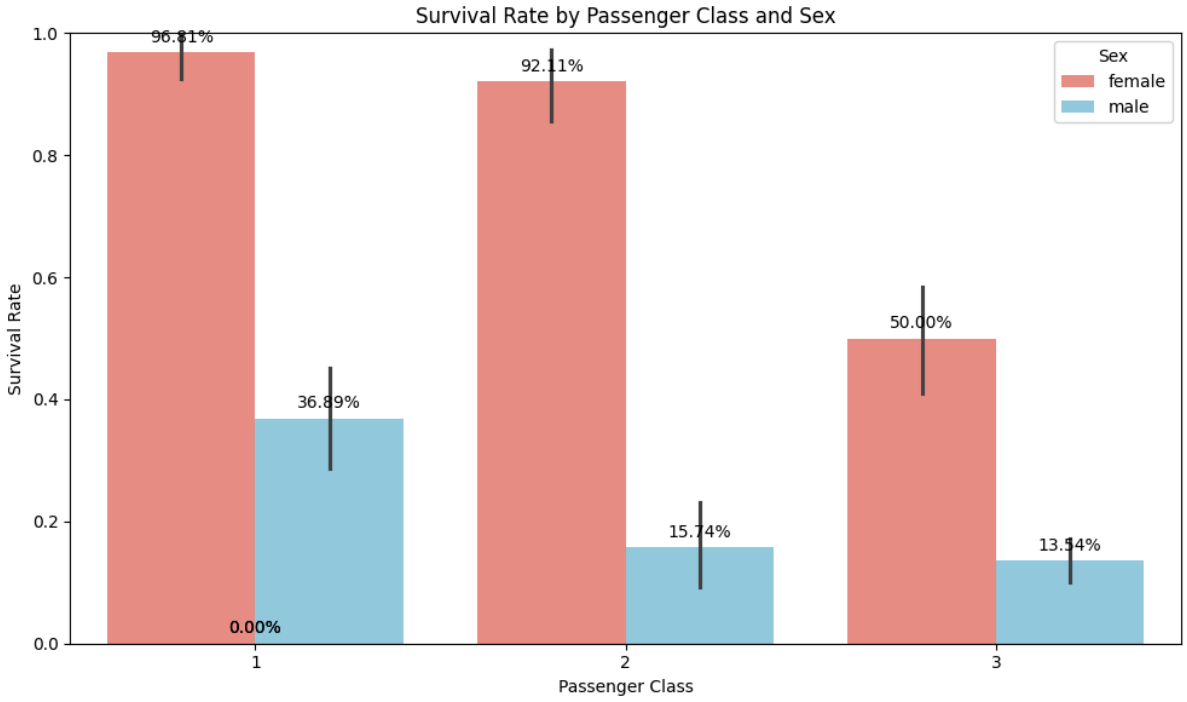


Analyzing survival rates broken down by two categorical features like Pclass and Sex

In [15]:
```
plt.figure(figsize=(10, 6))
ax_bp = sns.barplot(x='Pclass', y='Survived', hue='Sex', data=df,
                    palette={'male': 'skyblue', 'female': 'salmon'})
plt.title('Survival Rate by Passenger Class and Sex')
plt.ylabel('Survival Rate')
plt.xlabel('Passenger Class')
plt.ylim(0, 1) # Survival rate is between 0 and 1
```

```
plt.tight_layout()

# Add percentage text for barplot
for p in ax_bp.patches:
    ax_bp.annotate(f"{p.get_height()*100:.2f}%",
                   (p.get_x() + p.get_width() / 2., p.get_height()),
                   ha='center', va='center',
                   xytext=(0, 9), textcoords='offset points')
plt.show()
```



Correlation Catrix Using a Heatmap

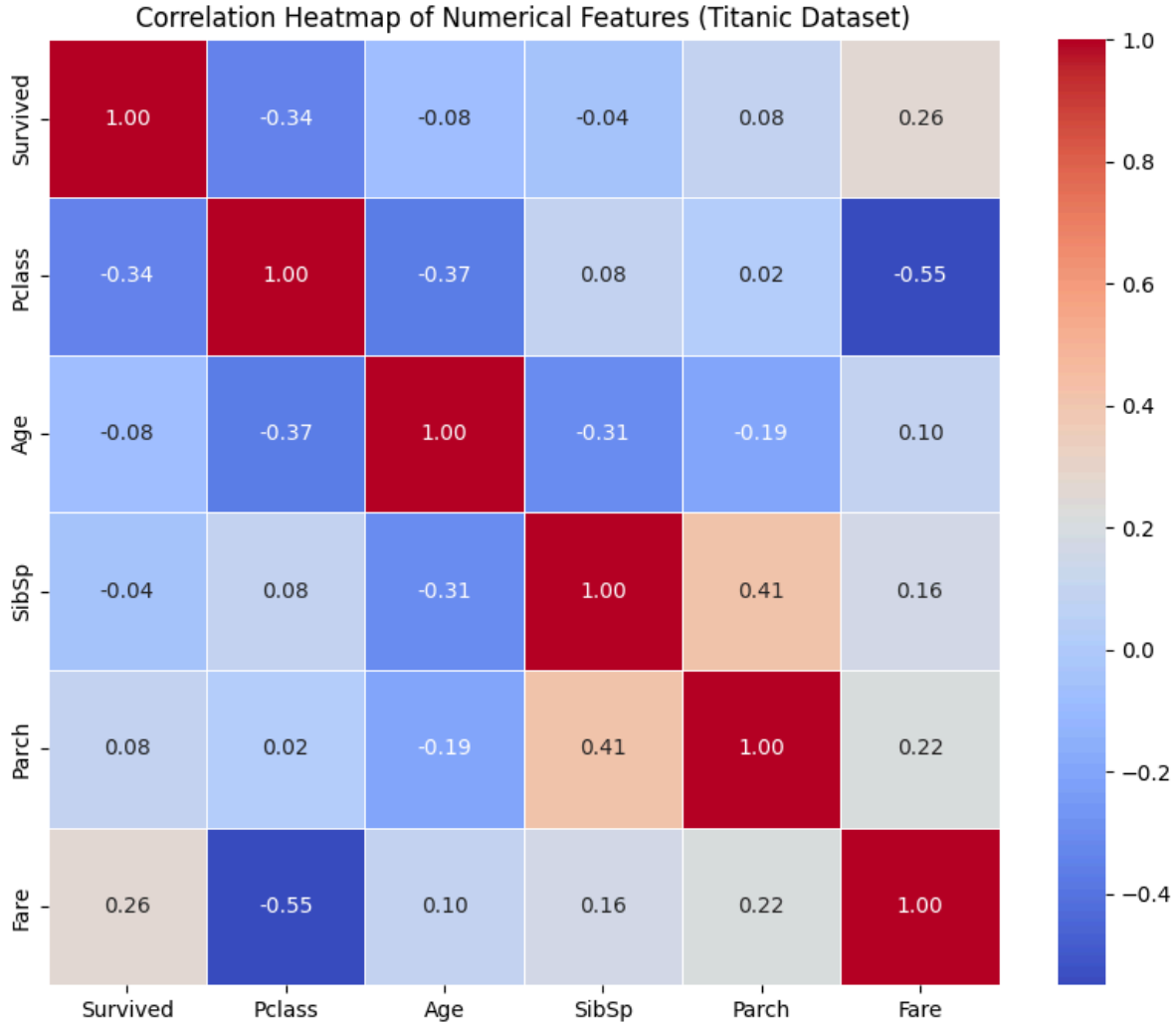
In [16]:
```
numerical_features_df = df[['Survived', 'Pclass', 'Age', 'SibSp', 'Parch', '

correlation_matrix = numerical_features_df.corr()

print("Correlation Matrix:")
print(correlation_matrix)

plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix,
            annot=True,
            cmap='coolwarm',
            fmt=".2f",
            linewidths=.5)
plt.title('Correlation Heatmap of Numerical Features (Titanic Dataset)')
plt.show()
```

```
Correlation Matrix:
          Survived    Pclass       Age     SibSp     Parch      Fare
Survived  1.000000 -0.338481 -0.077221 -0.035322  0.081629  0.257307
Pclass   -0.338481  1.000000 -0.369226  0.083081  0.018443 -0.549500
Age      -0.077221 -0.369226  1.000000 -0.308247 -0.189119  0.096067
SibSp    -0.035322  0.083081 -0.308247  1.000000  0.414838  0.159651
Parch     0.081629  0.018443 -0.189119  0.414838  1.000000  0.216225
Fare      0.257307 -0.549500  0.096067  0.159651  0.216225  1.000000
```



Outlier Detection

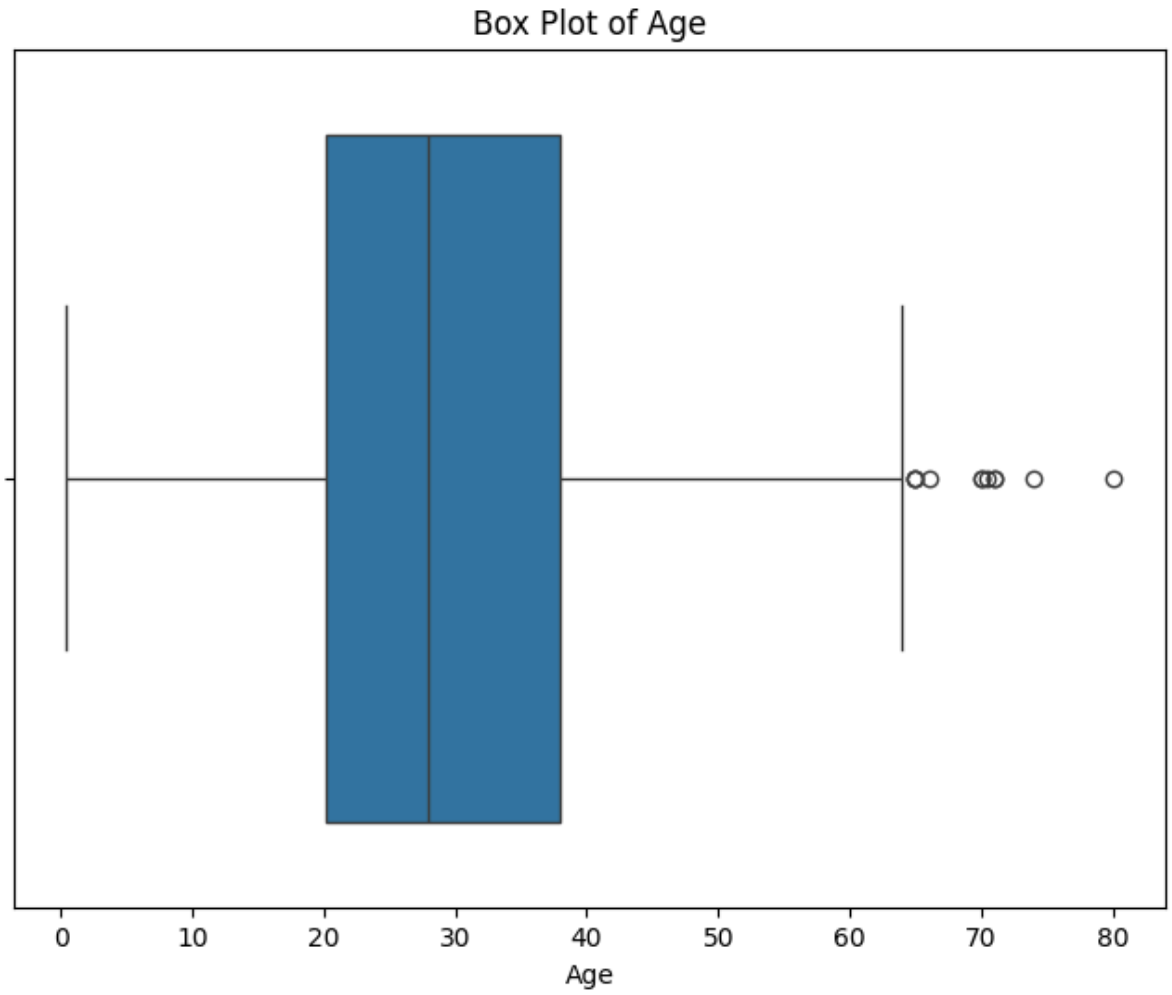
In [17]:

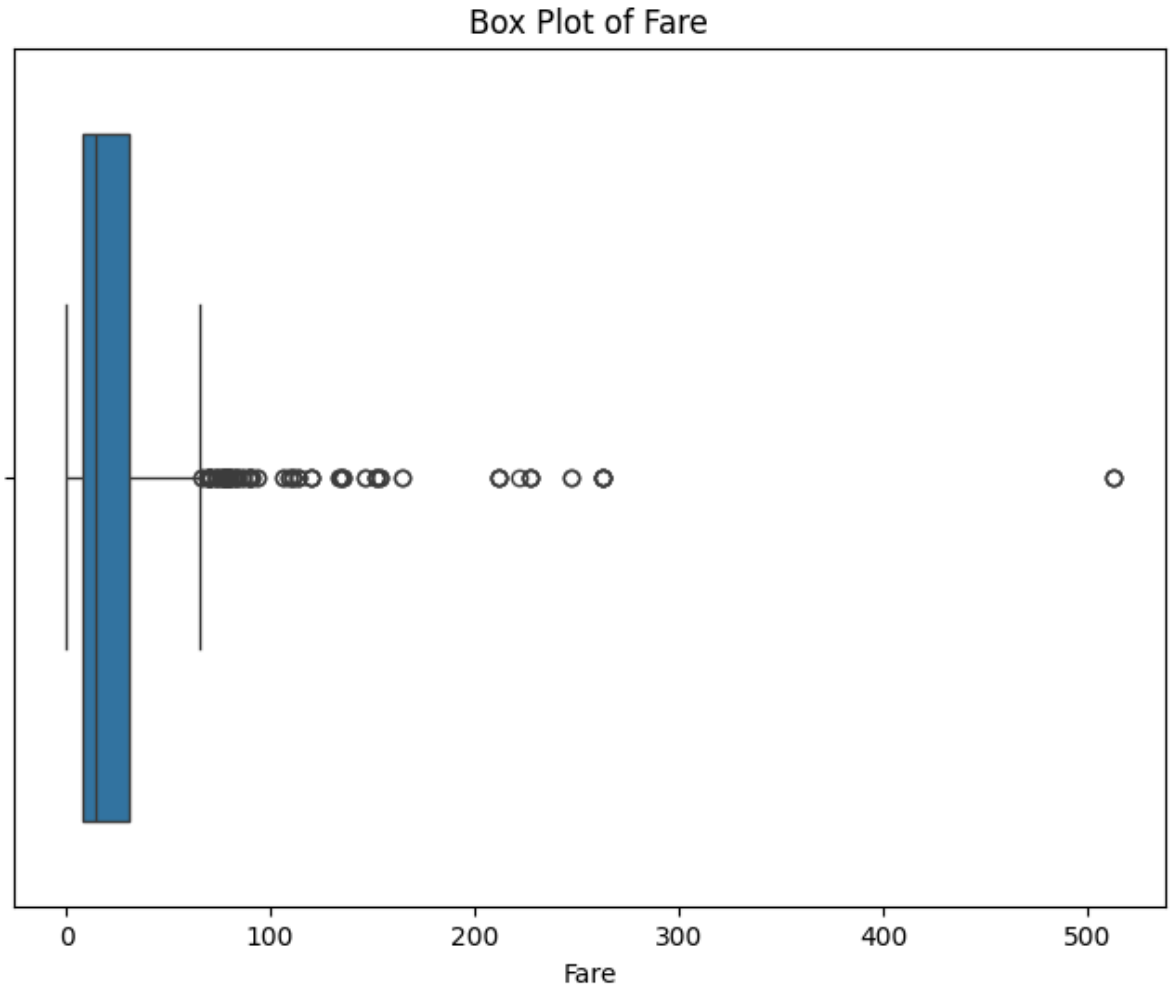
```
plt.figure(figsize=(8, 6))
sns.boxplot(x=df['Age']) # For a single feature
plt.title('Box Plot of Age')
plt.show()

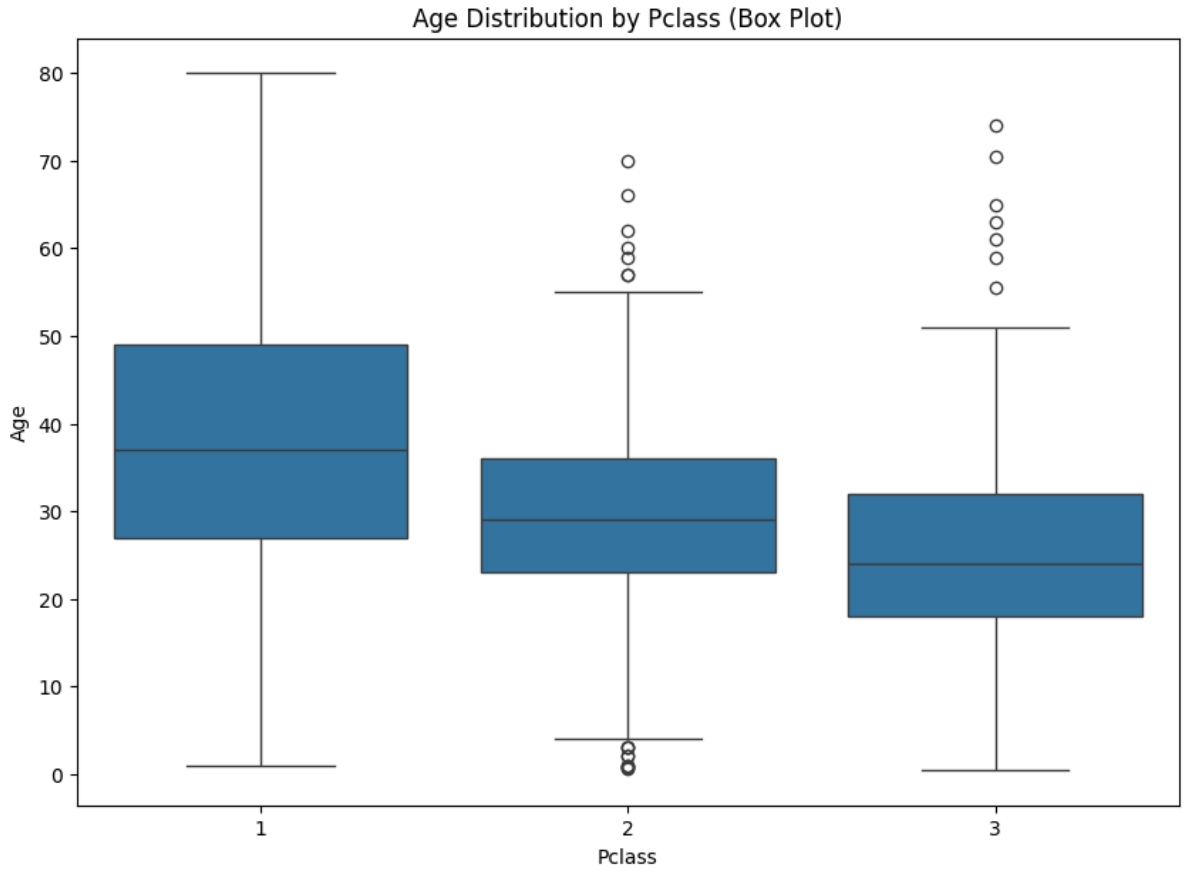
plt.figure(figsize=(8, 6))
sns.boxplot(x=df['Fare'])
plt.title('Box Plot of Fare')
plt.show()

# You can also plot for different categories
plt.figure(figsize=(10, 7))
```

```
sns.boxplot(x='Pclass', y='Age', data=df)
plt.title('Age Distribution by Pclass (Box Plot)')
plt.show()
```




Box Plot of Fare
0
100
200
300
400
500
Fare


Age Distribution by Pclass (Box Plot)
Age
0
10
20
30
40
50
60
70
80
1
2
3
Pclass

Hadnling Missing Values

In [18]:
```
# Calculate median from the training set ONLY
median_age = df['Age'].median()
df.fillna({'Age': median_age}, inplace=True)
```

In [19]:
```
df = df.drop('Cabin', axis=1)
```

In [20]:
```
embarked_mode = df['Embarked'].mode()[0]
print(f"Mode of Embarked: {embarked_mode}")

df['Embarked'] = df['Embarked'].fillna(embarked_mode)
```

```
Mode of Embarked: S
```

In [21]:
```
missing_counts = df.isnull().sum()
print("Missing Value Counts per Column:")
print(missing_counts[missing_counts > 0])

missing_percentages = (df.isnull().sum() / total_rows) * 100
print("\nMissing Value Percentages per Column:")
print(missing_percentages[missing_percentages > 0].sort_values(ascending=Fal

plt.figure(figsize=(12, 7))
sns.heatmap(df.isnull(), yticklabels=False, cbar=False, cmap='viridis')
plt.title('Missing Data Heatmap (Yellow = Missing)')
plt.show()
```

```
Missing Value Counts per Column:
Series([], dtype: int64)

Missing Value Percentages per Column:
Series([], dtype: float64)
```

Feature Enginneering

In [22]:
```
# For 'Sex'
sex_mapping = {'male': 0, 'female': 1}
df['Sex_encoded'] = df['Sex'].map(sex_mapping)

# For 'Embarked'
embarked_categories = df['Embarked'].unique() # Get unique categories in ora
embarked_mapping = {category: i for i, category in enumerate(embarked_catego
df['Embarked_encoded'] = df['Embarked'].map(embarked_mapping)
```

In [23]:
```
df = df.drop(['Name', 'Ticket', 'PassengerId','Embarked','Sex'], axis=1)
```

In [24]:
```
df.head()
```

Out[24]:

	Survived	Pclass	Age	SibSp	Parch	Fare	Sex_encoded	Embarked_encoded
0	0	3	22.0	1	0	7.2500	0	0
1	1	1	38.0	1	0	71.2833	1	1
2	1	3	26.0	0	0	7.9250	1	0
3	1	1	35.0	1	0	53.1000	1	0
4	0	3	35.0	0	0	8.0500	0	0

In [25]:
```
X = df.drop(columns=["Survived"], axis=1)
y = df["Survived"]
```

Setting up the Parameters for the Model

In [54]:
```
from sklearn.model_selection import train_test_split, cross_val_score


def classify(model):
    x_train, x_test, y_train, y_test = train_test_split(
        X, y, test_size=0.25, random_state=40
    )
    model.fit(x_train, y_train)
    print("Accuracy", model.score(x_test, y_test))

    score = cross_val_score(model, X, y, cv=5)
    print("CV SCORE :", np.mean(score))
```

In [55]:
```
from sklearn.tree import DecisionTreeClassifier

model = DecisionTreeClassifier()
classify(model)
```

```
Accuracy 0.7668161434977578
CV SCORE : 0.7766995166656205
```

In [56]:
```
from lightgbm import LGBMClassifier

model = LGBMClassifier()
classify(model)
```

```
[LightGBM] [Info] Number of positive: 247, number of negative: 421
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of te
sting was 0.000335 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 191
[LightGBM] [Info] Number of data points in the train set: 668, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.369760 -> initscore=-0.533
244
[LightGBM] [Info] Start training from score -0.533244
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
Accuracy 0.8295964125560538
```

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[LightGBM] [Info] Number of positive: 273, number of negative: 439
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of te
sting was 0.000090 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 202
[LightGBM] [Info] Number of data points in the train set: 712, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.383427 -> initscore=-0.475
028
[LightGBM] [Info] Start training from score -0.475028
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Number of positive: 274, number of negative: 439
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of te
sting was 0.000089 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 200
```

```
[LightGBM] [Info] Number of data points in the train set: 713, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.384292 -> initscore=-0.471
371
[LightGBM] [Info] Start training from score -0.471371
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Info] Number of positive: 274, number of negative: 439
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of te
sting was 0.000084 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 203
[LightGBM] [Info] Number of data points in the train set: 713, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.384292 -> initscore=-0.471
371
[LightGBM] [Info] Start training from score -0.471371
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Info] Number of positive: 274, number of negative: 439
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of te
sting was 0.000116 seconds.
You can set `force_row_wise=true` to remove the overhead.
And if memory is not enough, you can set `force_col_wise=true`.
[LightGBM] [Info] Total Bins 201
[LightGBM] [Info] Number of data points in the train set: 713, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.384292 -> initscore=-0.471
371
[LightGBM] [Info] Start training from score -0.471371
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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sting was 0.000114 seconds.
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And if memory is not enough, you can set `force_col_wise=true`.
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[LightGBM] [Info] Number of data points in the train set: 713, number of use
d features: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.382889 -> initscore=-0.477
303
[LightGBM] [Info] Start training from score -0.477303
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
CV SCORE : 0.8271797125102003
```

In [57]:
```python
from xgboost import XGBClassifier

model = XGBClassifier()
classify(model)
```

```
Accuracy 0.8116591928251121
CV SCORE : 0.823821480133074
```

In [58]:
```python
from sklearn.ensemble import RandomForestClassifier

model = RandomForestClassifier()
classify(model)
```

```
Accuracy 0.8116591928251121
CV SCORE : 0.8069926558282594
```

In [59]:
```python
from sklearn.ensemble import ExtraTreesClassifier

model = ExtraTreesClassifier()
classify(model)
```

```
Accuracy 0.8026905829596412
CV SCORE : 0.7935220639005711
```

In [60]:
```python
from sklearn.linear_model import LogisticRegression

model = LogisticRegression(max_iter=1000)
classify(model)
```

```
Accuracy 0.8071748878923767
CV SCORE : 0.7934906785512524
```

In [61]:
```python
model = XGBClassifier()
model.fit(X, y)
```

Out[61]:

```
XGBClassifier(base_score=None, booster=None, callbacks=None,
              colsample_bylevel=None, colsample_bynode=None,
              colsample_bytree=None, device=None, early_stopping_r
ounds=None,
              enable_categorical=False, eval_metric=None, feature_
types=None,
              gamma=None, grow_policy=None, importance_type=None,
              interaction_constraints=None, learning_rate=None, ma
x_bin=None,
```

In [62]:

```
file_path = '/content/drive/MyDrive/test.csv'
df_test = pd.read_csv(file_path)
```

In [64]:

```
X_test = df_test.drop(columns=["PassengerId", "Name", "Cabin", "Ticket"], ax
X_test
```

Out[64]:

	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	3	male	34.5	0	0	7.8292	Q
1	3	female	47.0	1	0	7.0000	S
2	2	male	62.0	0	0	9.6875	Q
3	3	male	27.0	0	0	8.6625	S
4	3	female	22.0	1	1	12.2875	S
...	...	...	...	...	...	...	...
413	3	male	NaN	0	0	8.0500	S
414	1	female	39.0	0	0	108.9000	C
415	3	male	38.5	0	0	7.2500	S
416	3	male	NaN	0	0	8.0500	S
417	3	male	NaN	1	1	22.3583	C

418 rows × 7 columns

In [65]:

```
from sklearn.preprocessing import LabelEncoder

cols = ["Sex", "Embarked"]
le = LabelEncoder()

for col in cols:
    X_test[col] = le.fit_transform(X_test[col])

X_test.head()
```

Out[65]:

	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	3	1	34.5	0	0	7.8292	1
1	3	0	47.0	1	0	7.0000	2
2	2	1	62.0	0	0	9.6875	1
3	3	1	27.0	0	0	8.6625	2
4	3	0	22.0	1	1	12.2875	2

In [66]:
```
X_test["Age"] = X_test["Age"].fillna(X_test["Age"].mean())
X_test["Fare"] = X_test["Fare"].fillna(X_test["Fare"].mean())

X_test.isnull().sum()
```

Out[66]:

	0
Pclass	0
Sex	0
Age	0
SibSp	0
Parch	0
Fare	0
Embarked	0

dtype: int64

Data Preprocessing

In [68]:
```
X_test = df_test.drop(columns=["PassengerId", "Name", "Cabin", "Ticket"], ax

X_test["Age"] = X_test["Age"].fillna(X_test["Age"].mean())
X_test["Fare"] = X_test["Fare"].fillna(X_test["Fare"].mean())

X_test.isnull().sum()

from sklearn.preprocessing import LabelEncoder

cols = ["Sex", "Embarked"]
le = LabelEncoder()

for col in cols:
    X_test[col] = le.fit_transform(X_test[col])

X_test.head()
X_test
```

Out[68]:

	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	3	1	34.50000	0	0	7.8292	1
1	3	0	47.00000	1	0	7.0000	2
2	2	1	62.00000	0	0	9.6875	1
3	3	1	27.00000	0	0	8.6625	2
4	3	0	22.00000	1	1	12.2875	2
...	...	...	...	...	...	...	...
413	3	1	30.27259	0	0	8.0500	2
414	1	0	39.00000	0	0	108.9000	0
415	3	1	38.50000	0	0	7.2500	2
416	3	1	30.27259	0	0	8.0500	2
417	3	1	30.27259	1	1	22.3583	0

418 rows × 7 columns

In [71]:
```
X_test = X_test.rename(columns={'Sex': 'Sex_encoded', 'Embarked': 'Embarked_
X_test
```

Out[71]:

	Pclass	Sex_encoded	Age	SibSp	Parch	Fare	Embarked_encoded
0	3	1	34.50000	0	0	7.8292	1
1	3	0	47.00000	1	0	7.0000	2
2	2	1	62.00000	0	0	9.6875	1
3	3	1	27.00000	0	0	8.6625	2
4	3	0	22.00000	1	1	12.2875	2
...	...	...	...	...	...	...	...
413	3	1	30.27259	0	0	8.0500	2
414	1	0	39.00000	0	0	108.9000	0
415	3	1	38.50000	0	0	7.2500	2
416	3	1	30.27259	0	0	8.0500	2
417	3	1	30.27259	1	1	22.3583	0

418 rows × 7 columns

Model Testing

In [73]:
```
train_cols = X.columns
X_test = X_test[train_cols]

pred = model.predict(X_test)
pred
```

Out[73]:
```
array([0, 0, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 0,
       0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0,
       0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0,
       0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1,
       0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 1,
       1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 1,
       0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0,
       0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0,
       1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0,
       0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0,
       1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1,
       1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0,
       0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1,
       1, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1,
       0, 1, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1,
       1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0,
       0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 1, 1, 0,
       1, 0, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0])
```