In [10]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

SETUP NOTEBOOK

In [11]:
```
df = pd.read_csv("titanic_train_dataset.csv")
df.head()
```

Out[11]:

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

INITIAL EXPLORATION

In [12]:
```
df.shape
```

Out[12]:
```
(891, 12)
```

In [13]:
```
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 [14]:
```
df.describe()
```

Out[14]:

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

In [15]:
```
df.isnull().sum()
```

Out[15]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [16]:
```
df.duplicated().sum()
```

Out[16]:
```
np.int64(0)
```

In [21]:
```
# Safely fill missing Age values
df['Age'] = df['Age'].fillna(df['Age'].median())

# Safely drop Cabin column if it exists
if 'Cabin' in df.columns:
    df.drop(columns='Cabin', inplace=True)

# Fill missing Embarked values with mode
df['Embarked'] = df['Embarked'].fillna(df['Embarked'].mode()[0])
```

In [22]:
```
df.isnull().sum()
```

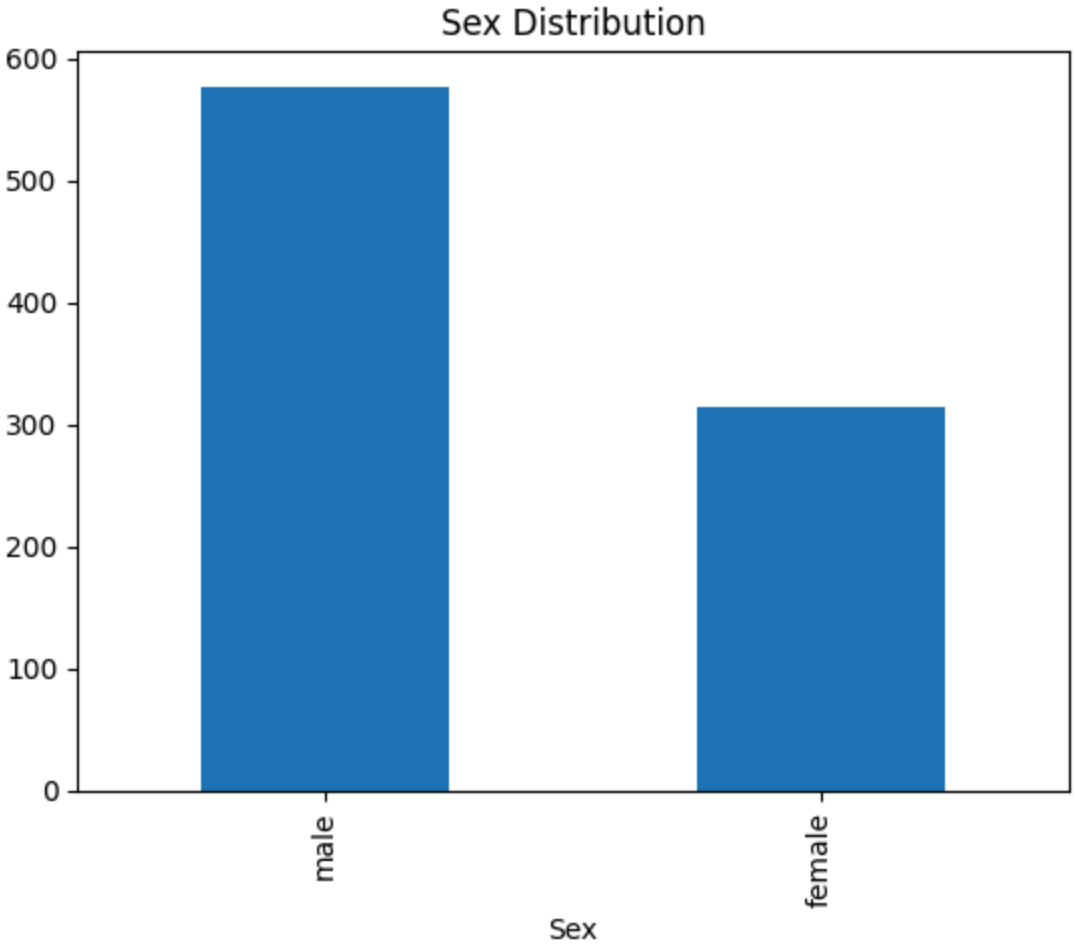
Out[22]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

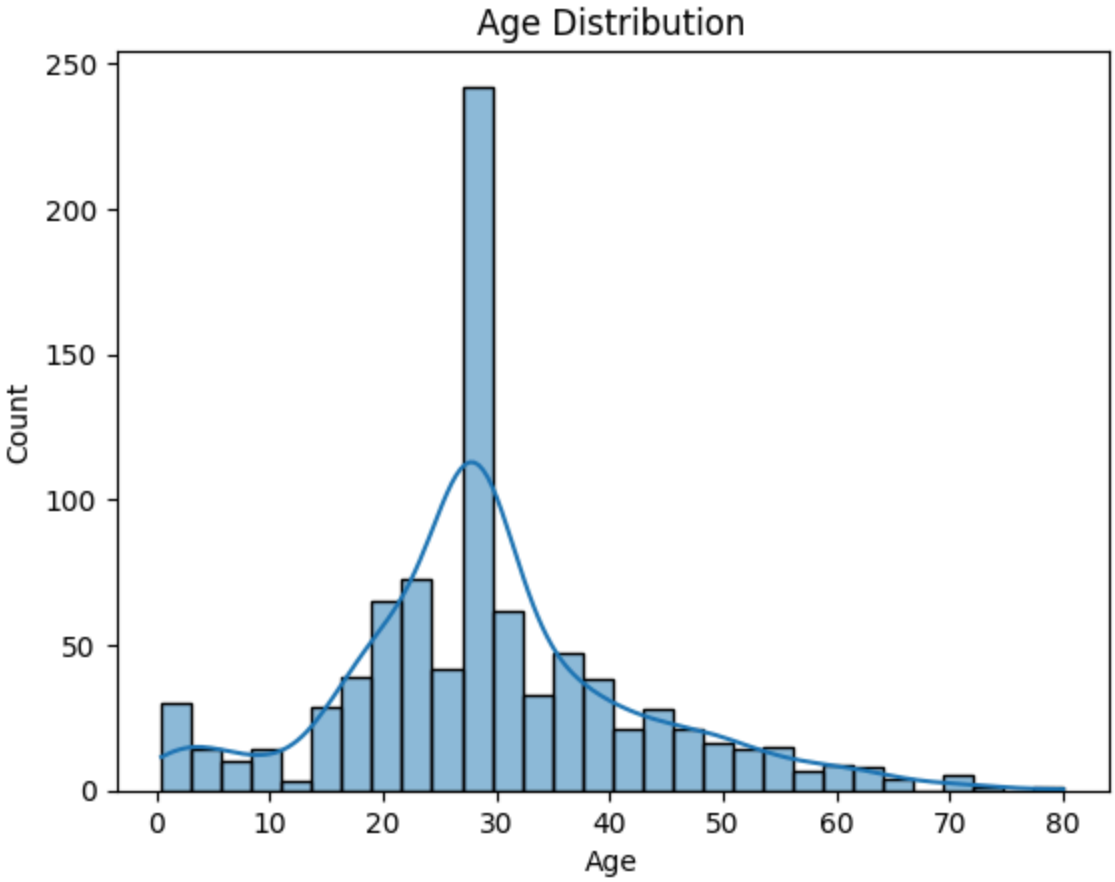
UNIVARIATE ANALYSIS (SINGLE FEATURE)

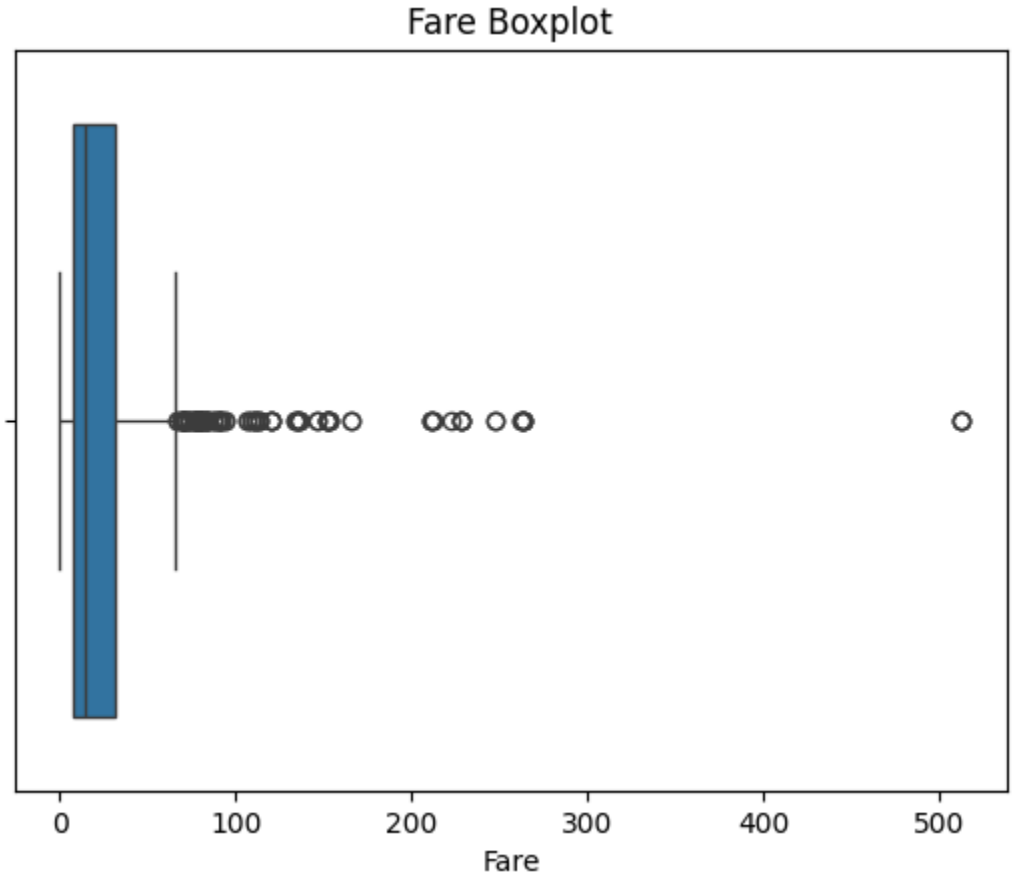
In [23]:
```
# Categorical
df['Sex'].value_counts().plot(kind='bar', title='Sex Distribution')
plt.show()

# Numerical
sns.histplot(df['Age'].dropna(), kde=True)
plt.title('Age Distribution')
plt.show()

sns.boxplot(x=df['Fare'])
plt.title('Fare Boxplot')
plt.show()
```


Sex Distribution
600
500
400
300
200
100
0
male
female
Sex

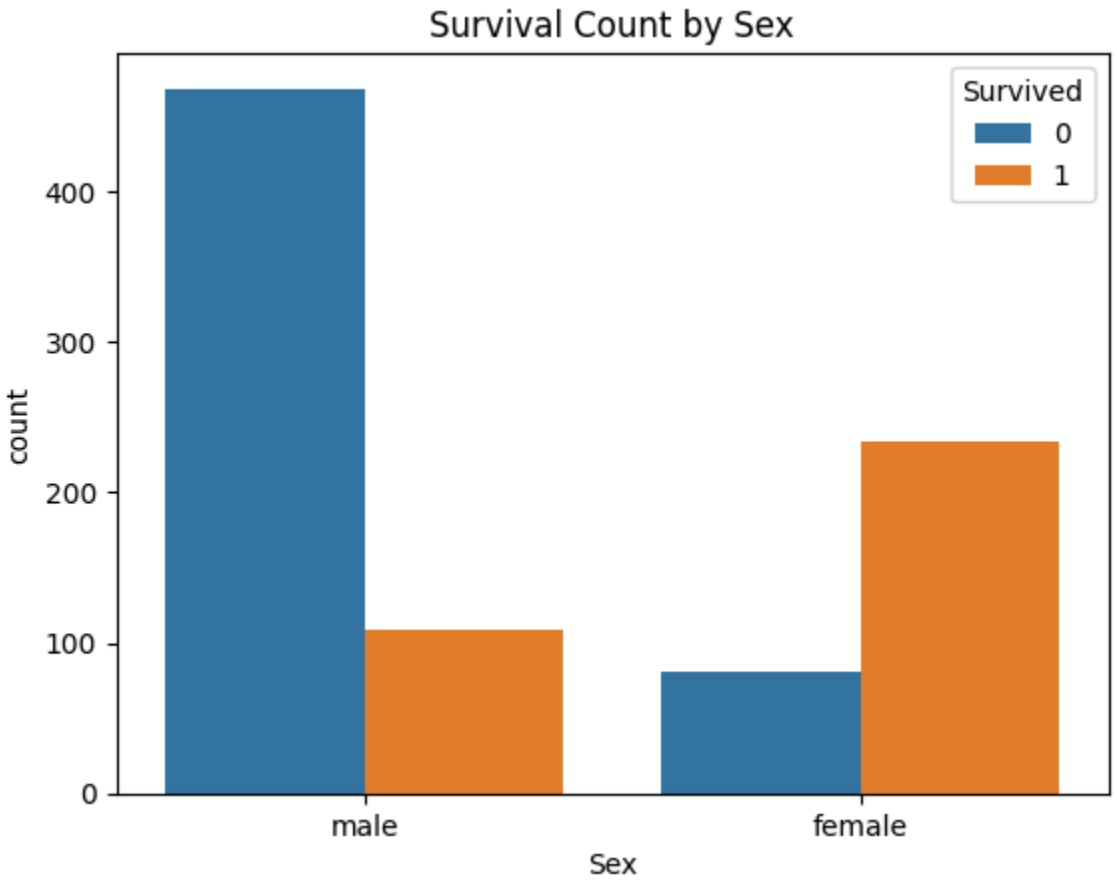

Age Distribution
Count
Age
0
50
100
150
200
250
0
10
20
30
40
50
60
70
80

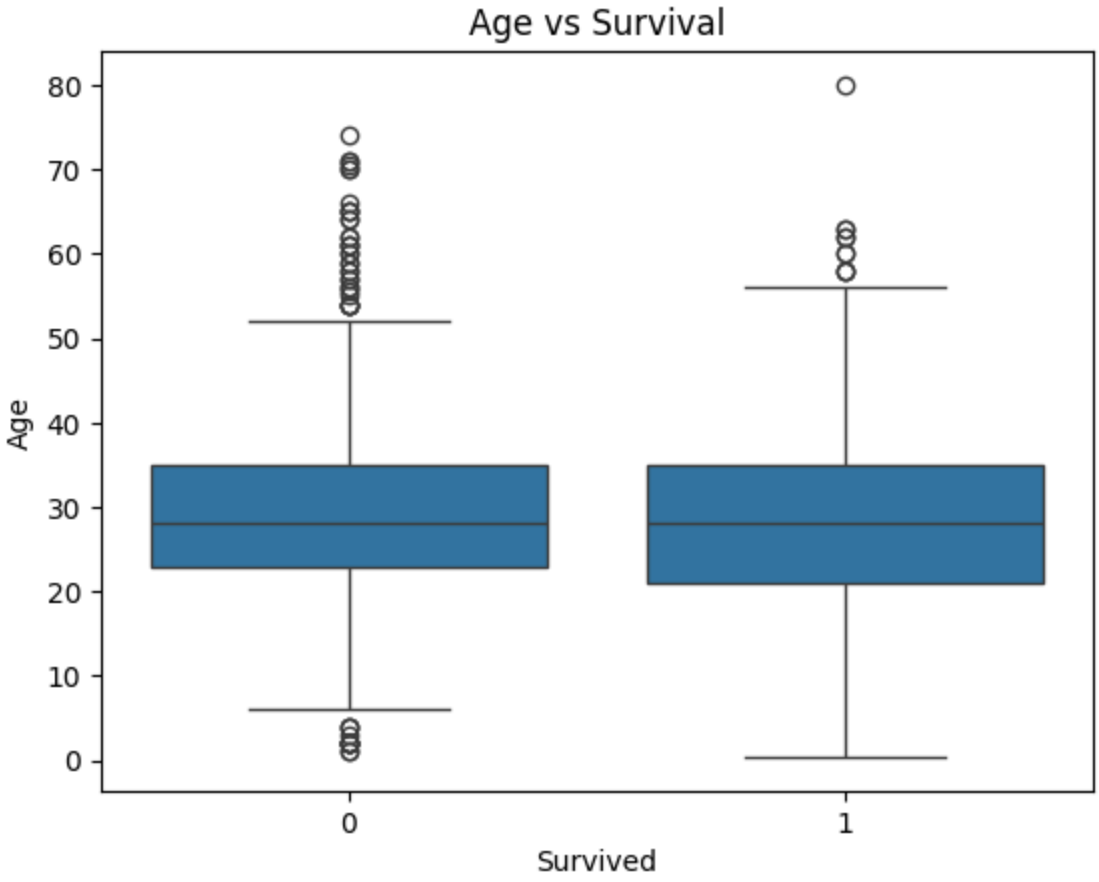

Fare Boxplot
Fare
0
100
200
300
400
500

BIVARIATE ANALYSIS

In [24]:
```
# Survived vs Sex
sns.countplot(x='Sex', hue='Survived', data=df)
plt.title('Survival Count by Sex')
plt.show()

# Age vs Survived
sns.boxplot(x='Survived', y='Age', data=df)
plt.title('Age vs Survival')
plt.show()
```

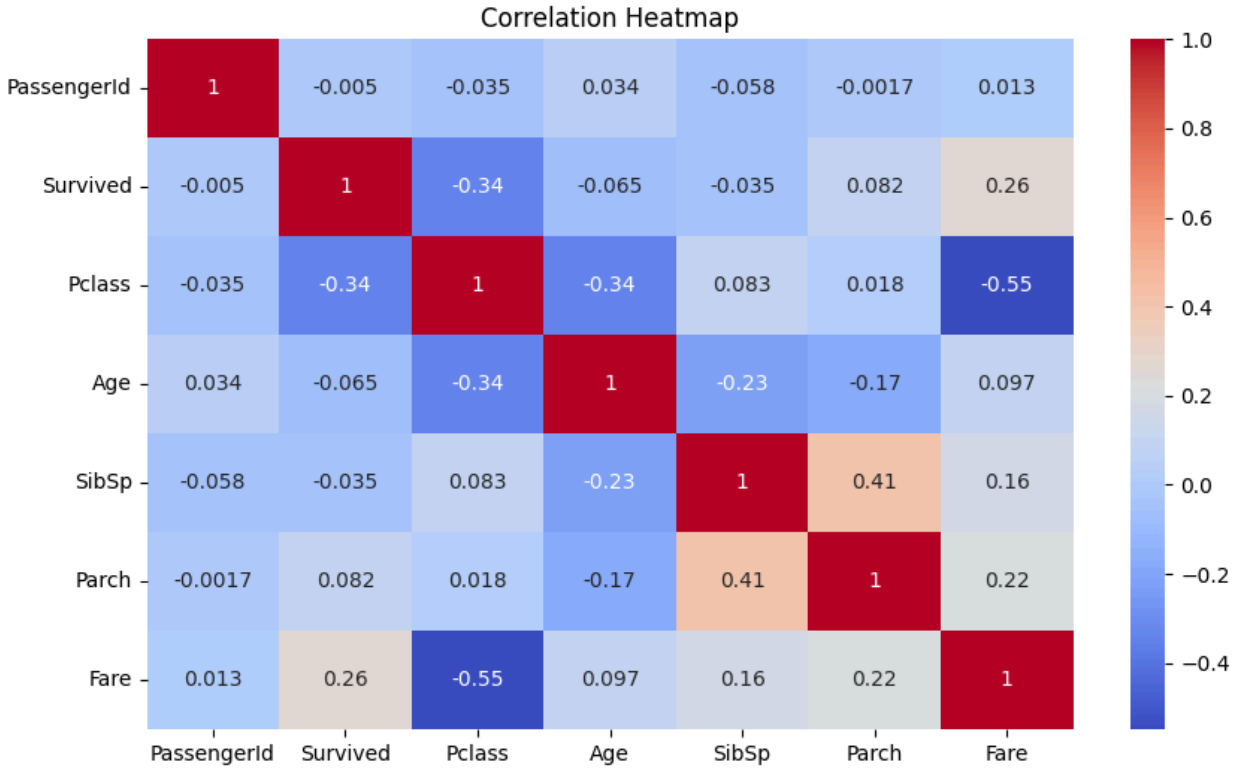




MULTIVARIATE ANALYSIS

In [26]:
```
# Select only numeric columns for correlation
numeric_df = df.select_dtypes(include=['number'])

# Plot heatmap
plt.figure(figsize=(10,6))
sns.heatmap(numeric_df.corr(), annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```



Summary of Insights:

- Females had a higher survival rate than males.
- Passengers in 1st class had better chances of survival.
- Fare and Age had weak correlation with survival.
- Most passengers were in the age range 20-40.

In [ ]: