In [15]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings. filterwarnings( 'ignore')
%matplotlib inline
```

In [16]:
```
df=pd.read_csv('Titanic-Dataset.csv')
df
```

Out[16]:

	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	7
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	5
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	
...	...	...	...	...	...	...	...	...	...	
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	1
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	3
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	2
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	3
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	

891 rows × 12 columns

In [17]:
```
train= pd.read_csv('train.csv')
test = pd.read_csv('test.csv')
train.head()
```

Out[17]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	F
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0

In [18]:
```
train.describe()
```

Out[18]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329

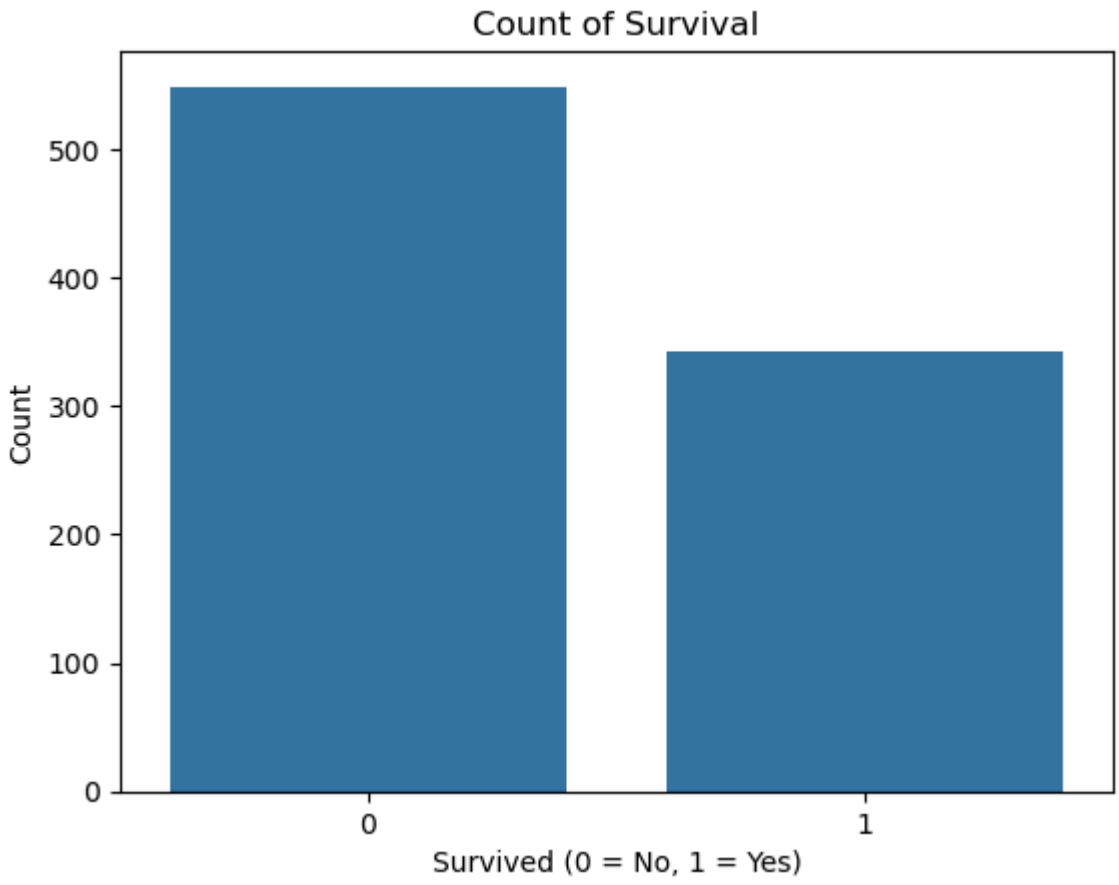
statistical info

In [19]:
```
train.info()
```

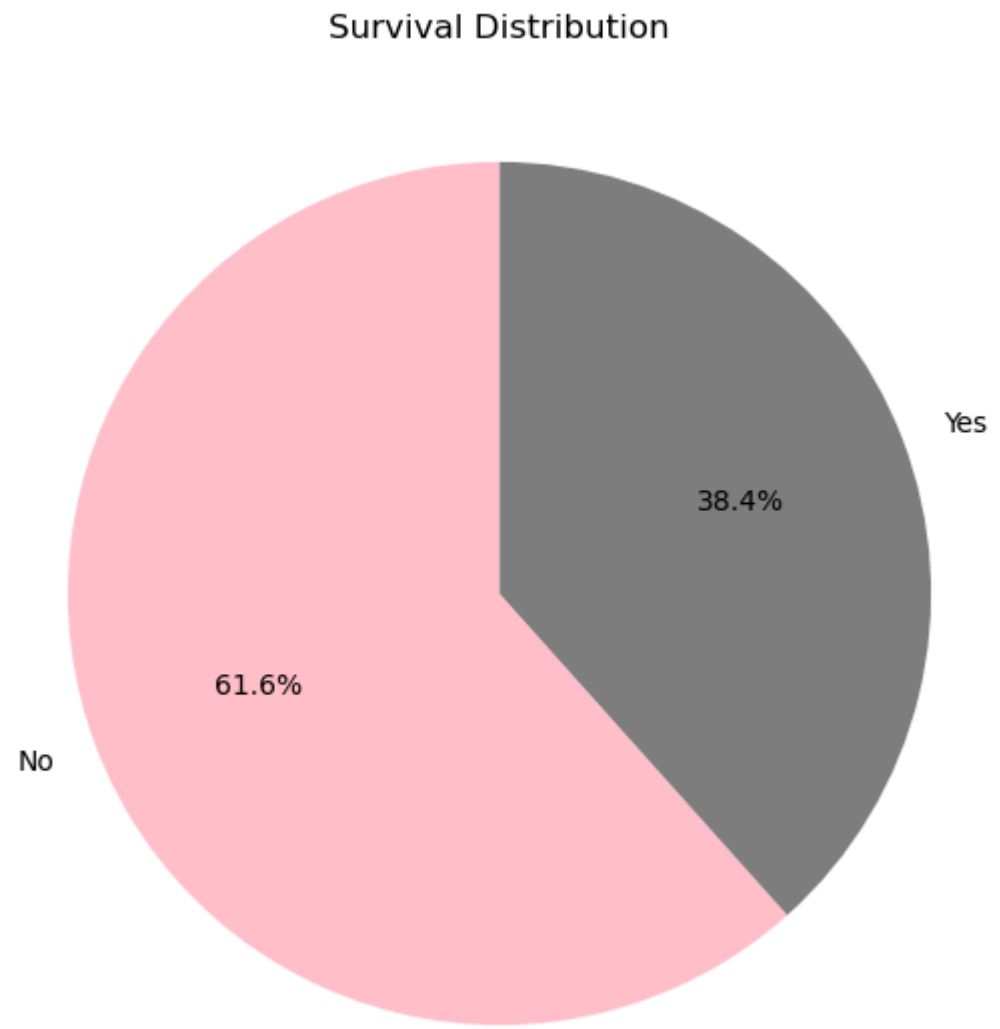
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    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
```

Exploratory data analysis

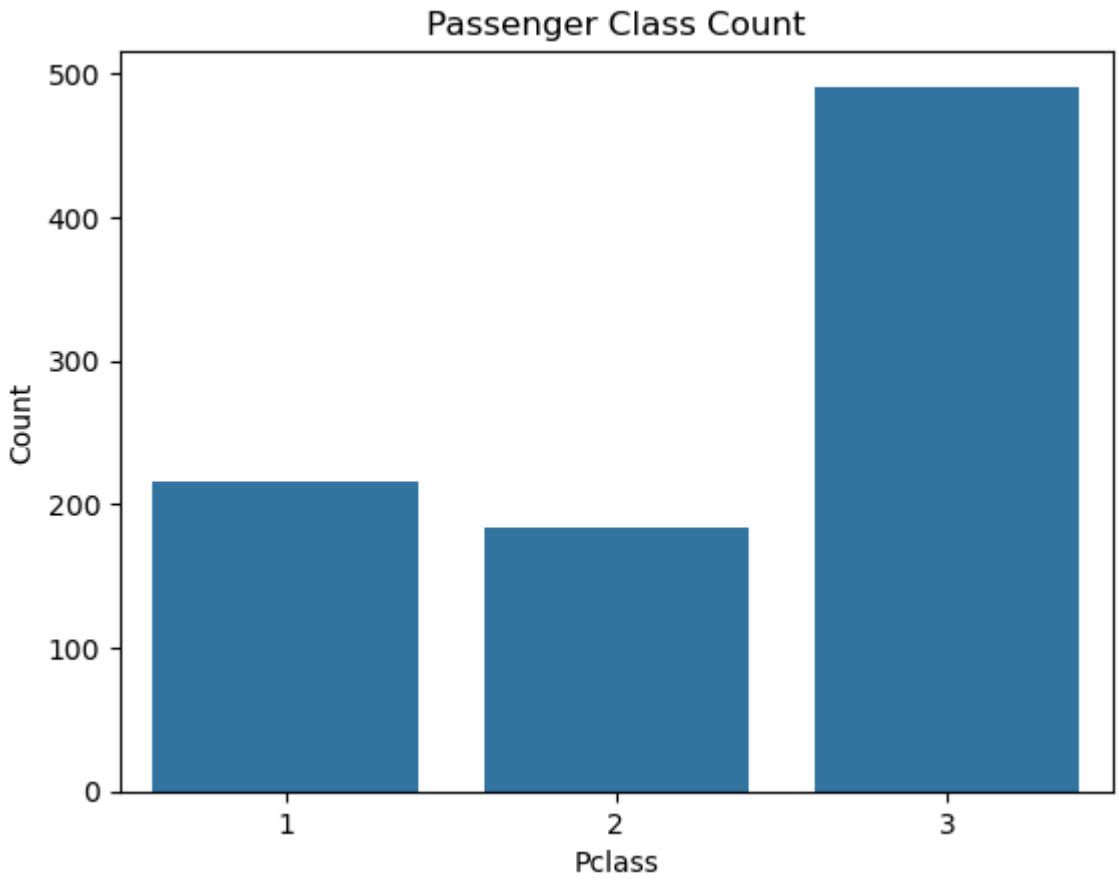
In [20]:
```
df=pd.read_csv('Titanic-Dataset.csv')
train= pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='Survived', data=train)
plt.title("Count of Survival")
plt.xlabel("Survived (0 = No, 1 = Yes)")
plt.ylabel("Count")
plt.show()
```



In [21]:
```
train = pd.read_csv('Titanic-Dataset.csv')
survival_counts = train['Survived'].value_counts()
plt.figure(figsize=(7, 7))
plt.pie(survival_counts, labels=['No', 'Yes'], autopct='%1.1f%%', startangle=90,
plt.title("Survival Distribution")
plt.show()
```



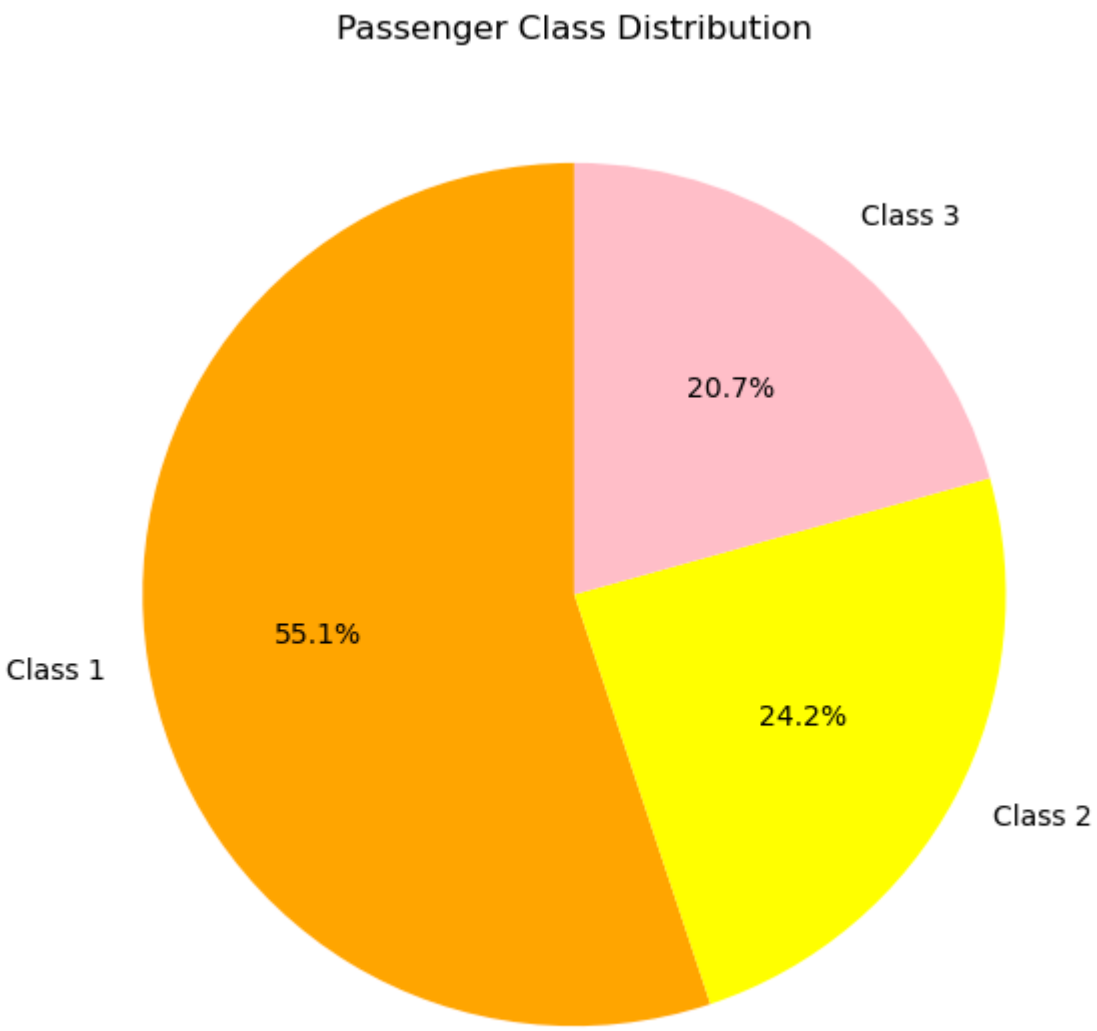
In [22]:
```
df=pd.read_csv('Titanic-Dataset.csv')
train= pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='Pclass', data=train)
plt.title("Passenger Class Count")
plt.xlabel("Pclass")
plt.ylabel("Count")
plt.show()
```



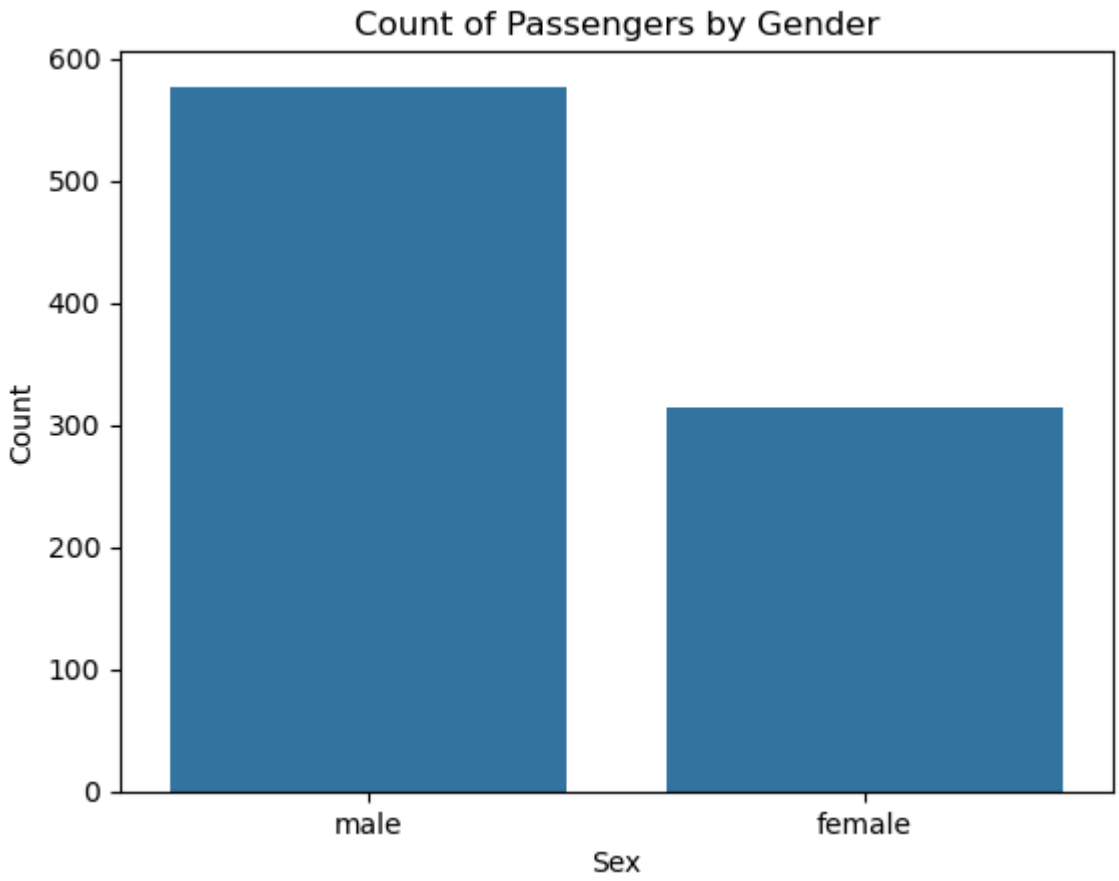
In [23]:
```
train = pd.read_csv('Titanic-Dataset.csv')

pclass_counts = train['Pclass'].value_counts()

plt.figure(figsize=(7, 7))
plt.pie(pclass_counts, labels=['Class 1', 'Class 2', 'Class 3'], autopct='%1.1f%
plt.title("Passenger Class Distribution")
plt.show()
```



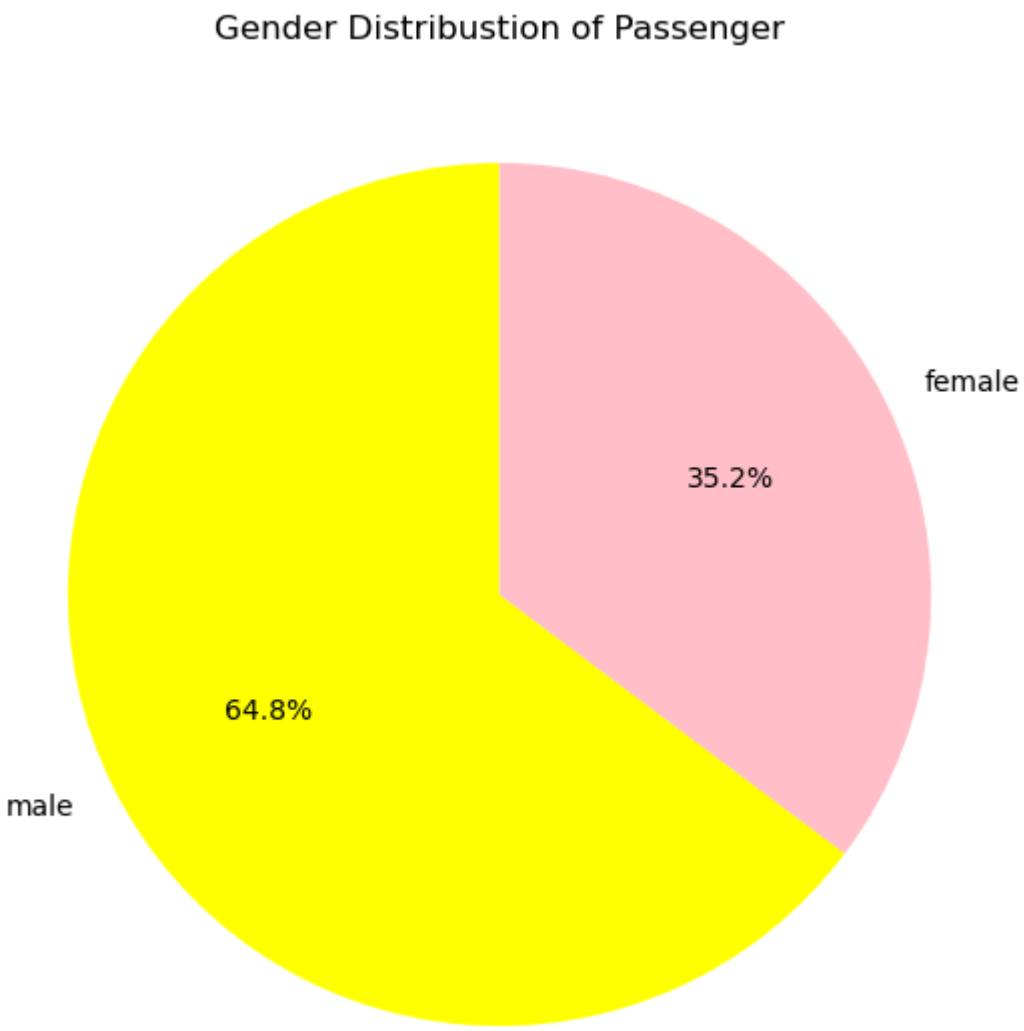
In [24]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='Sex', data=train)
plt.title("Count of Passengers by Gender")
plt.xlabel("Sex")
plt.ylabel("Count")
plt.show()
```



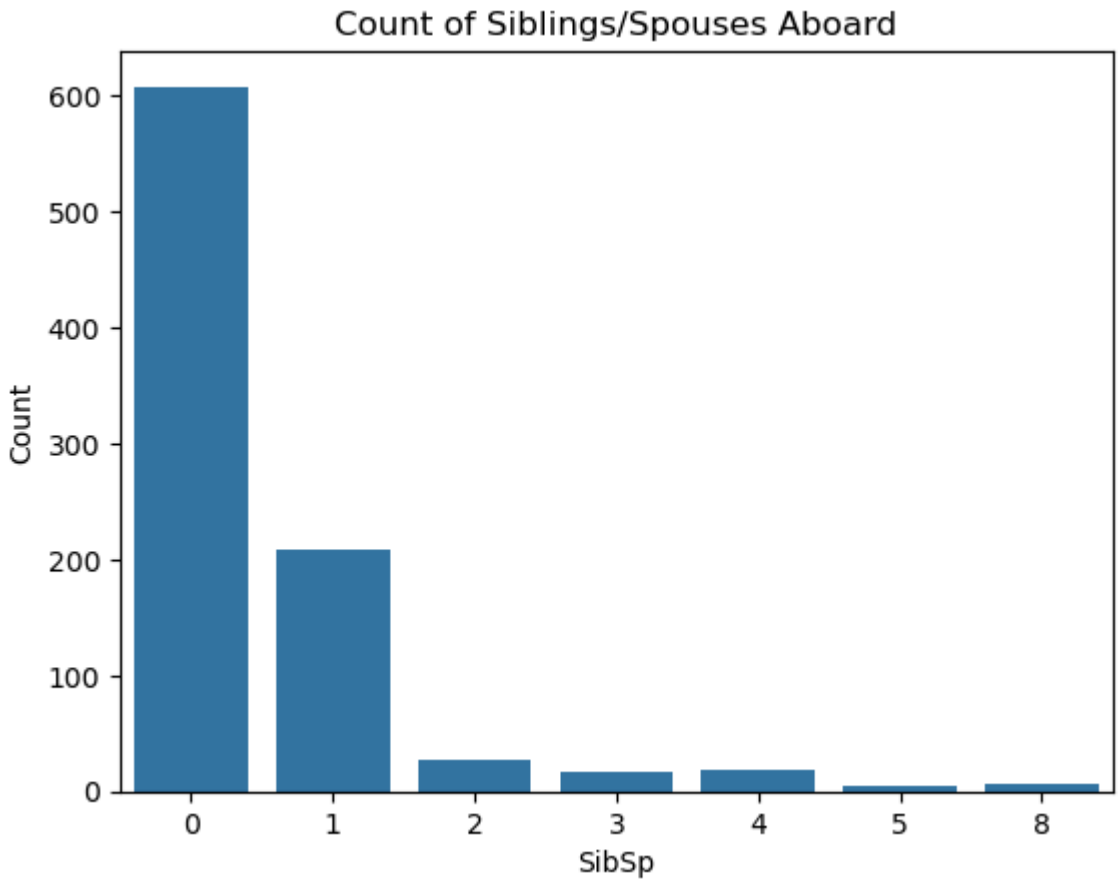
In [25]:
```
train = pd.read_csv('Titanic-Dataset.csv')

sex_counts = train['Sex'].value_counts()

plt.figure(figsize=(7, 7))
plt.pie(sex_counts, labels=sex_counts.index, autopct='%1.1f%%', startangle=90, c
plt.title("Gender Distribustion of Passenger")
plt.show()
```



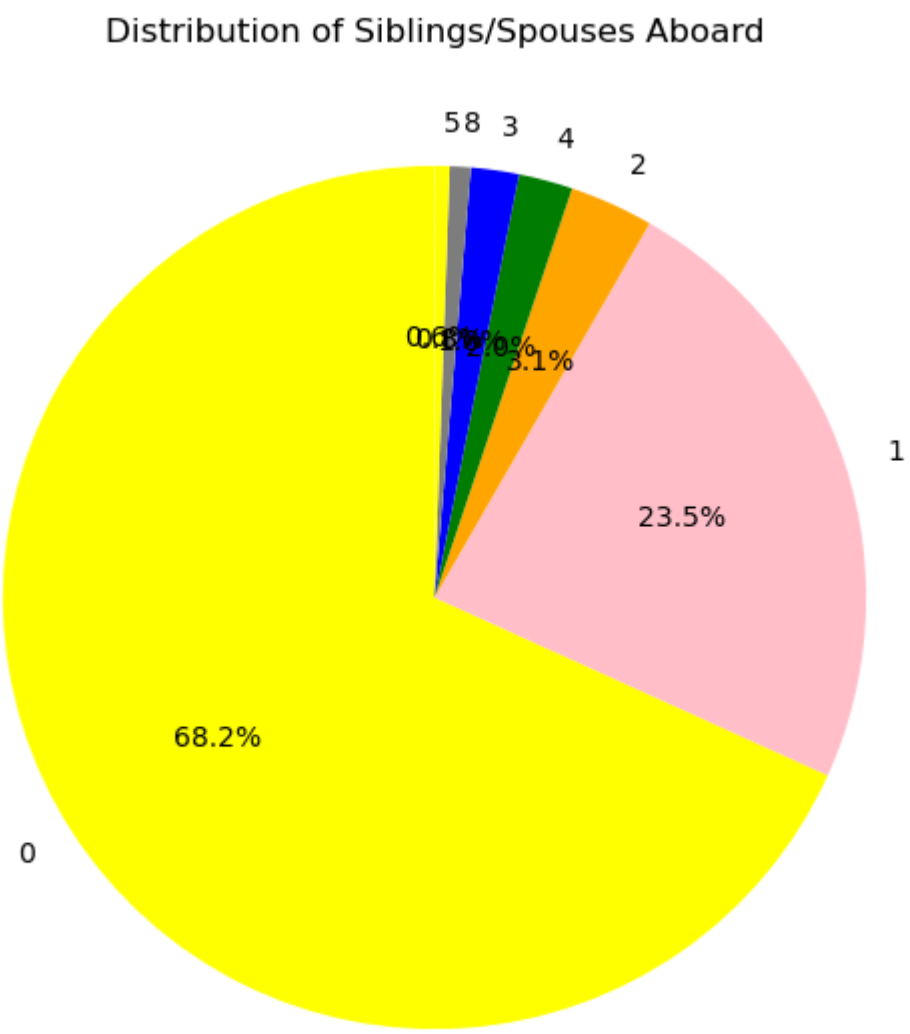
In [26]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='SibSp', data=train)
plt.title("Count of Siblings/Spouses Aboard")
plt.xlabel("SibSp")
plt.ylabel("Count")
plt.show()
```



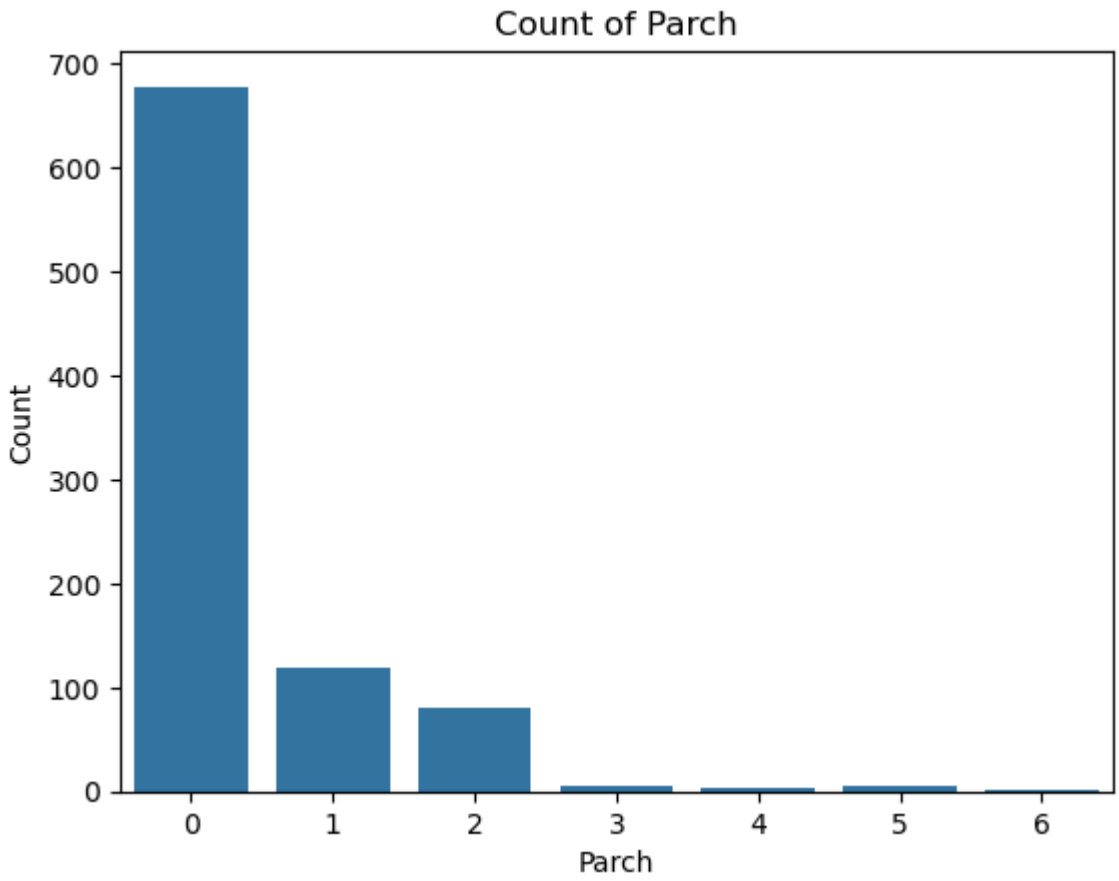
In [27]:
```
train = pd.read_csv('Titanic-Dataset.csv')


sibsp_counts = train['SibSp'].value_counts()

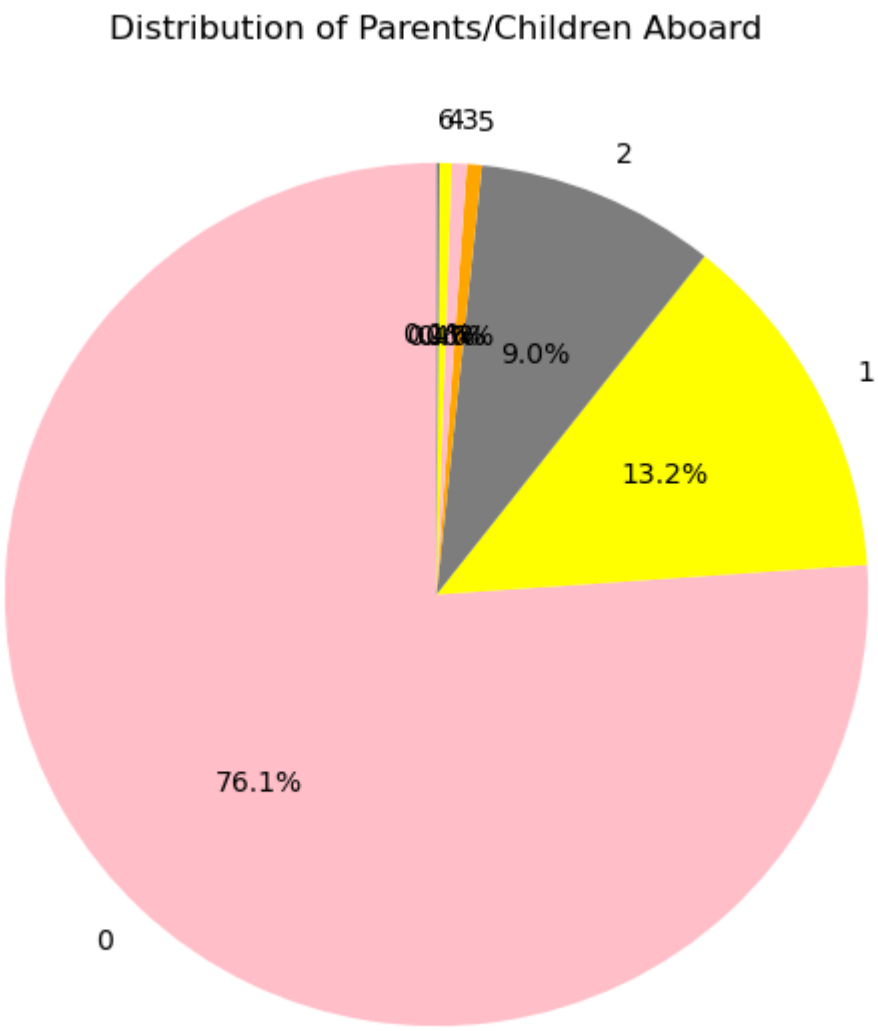

plt.figure(figsize=(7, 7))
plt.pie(sibsp_counts, labels=sibsp_counts.index, autopct='%1.1f%%', startangle=9
plt.title("Distribution of Siblings/Spouses Aboard")
plt.show()
```



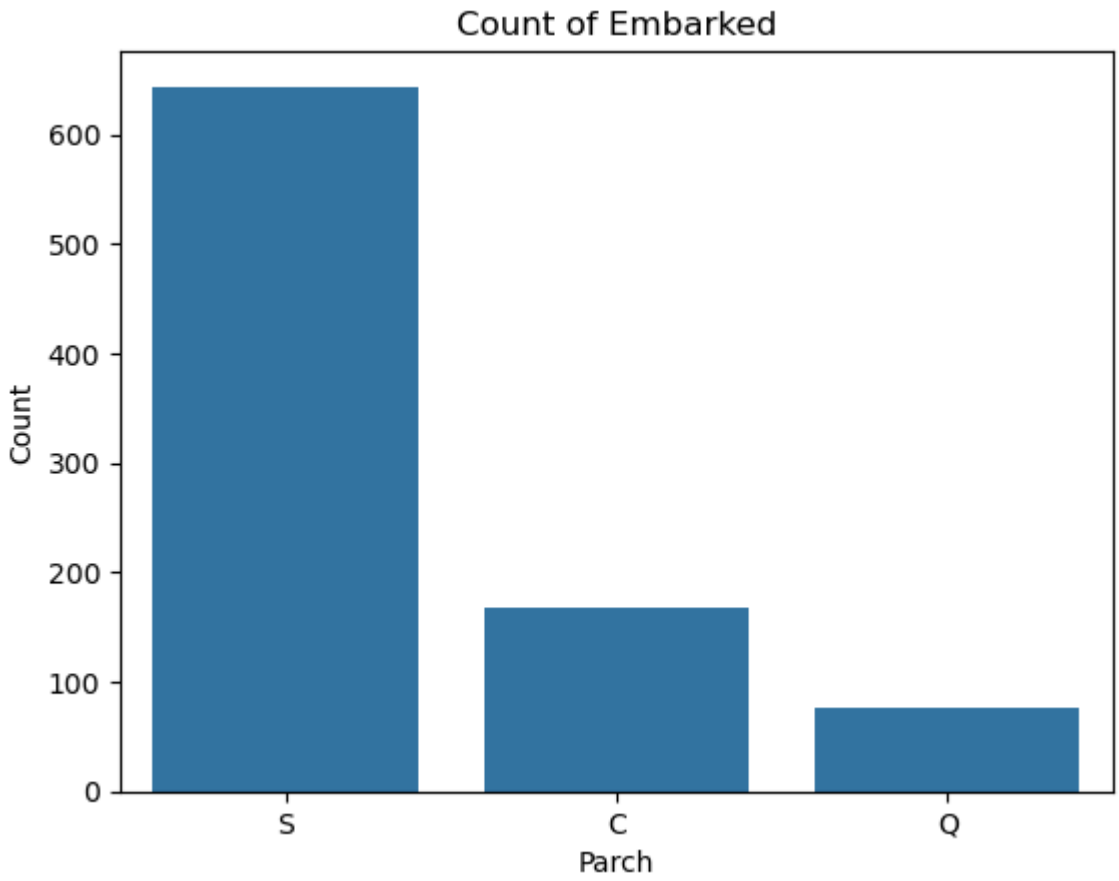
In [28]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='Parch', data=train)
plt.title("Count of Parch")
plt.xlabel("Parch")
plt.ylabel("Count")
plt.show()
```



In [29]:
```
train = pd.read_csv('Titanic-Dataset.csv')
parch_counts = train['Parch'].value_counts()
plt.figure(figsize=(7, 7))
plt.pie(parch_counts, labels=parch_counts.index, autopct='%1.1f%%', startangle=9
)
plt.title("Distribution of Parents/Children Aboard")
plt.show()
```



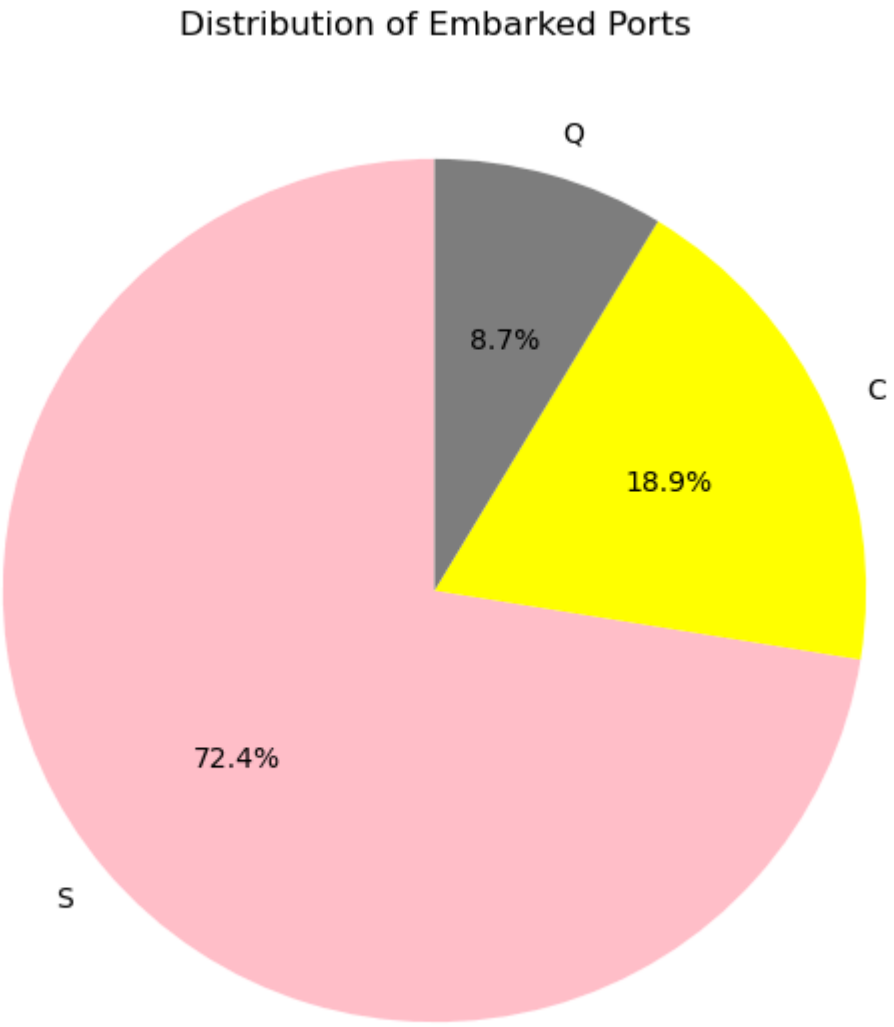
In [30]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.countplot(x='Embarked', data=train)
plt.title("Count of Embarked")
plt.xlabel("Parch")
plt.ylabel("Count")
plt.show()
```



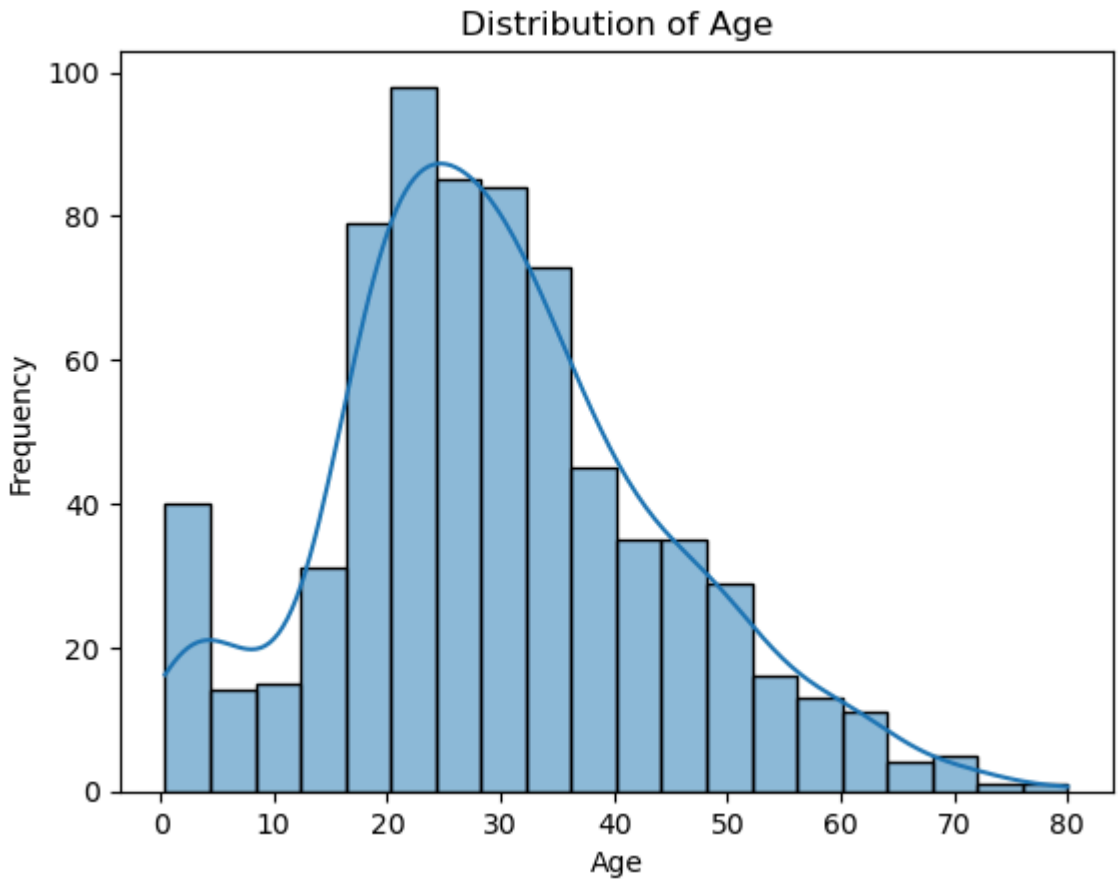
In [31]:
```
train = pd.read_csv('Titanic-Dataset.csv')

embarked_counts = train['Embarked'].value_counts()

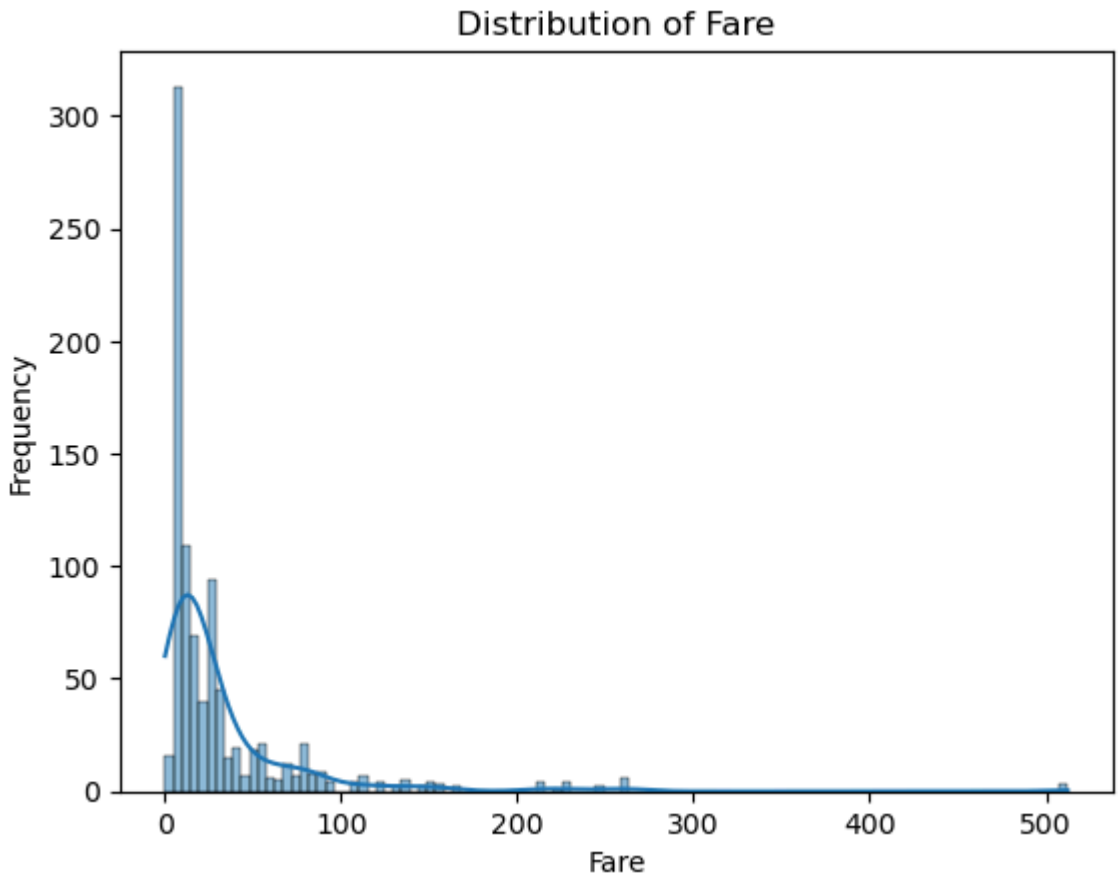
plt.figure(figsize=(7, 7))
plt.pie(embarked_counts, labels=embarked_counts.index, autopct='%1.1f%%', starta
plt.title("Distribution of Embarked Ports")
plt.show()
```



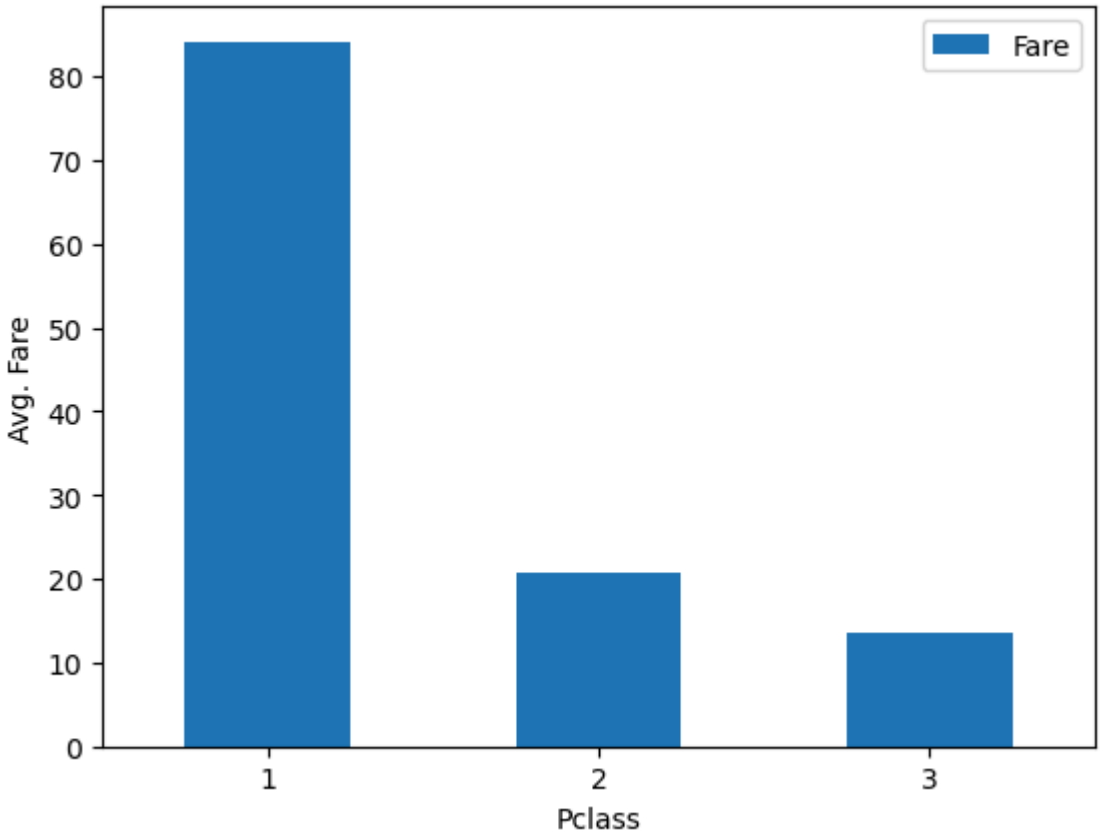
In [32]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.histplot(train['Age'], kde=True)
plt.title('Distribution of Age')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.show()
```



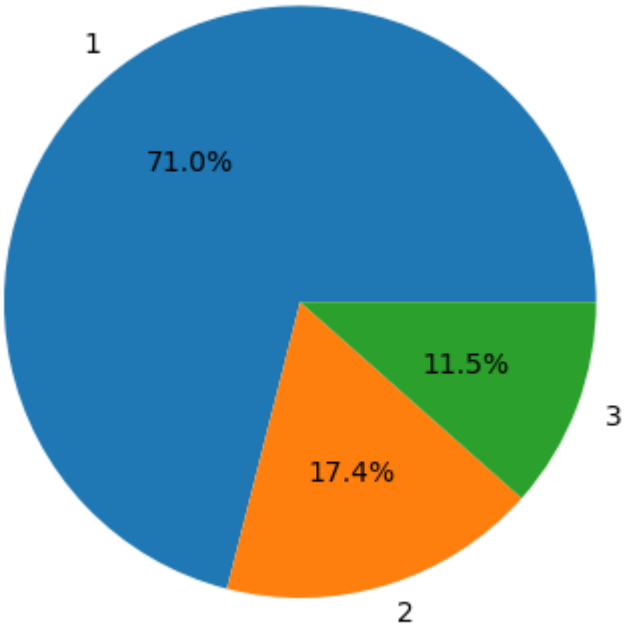
In [33]:
```
train = pd.read_csv('Titanic-Dataset.csv')
sns.histplot(train['Fare'], kde=True)
plt.title('Distribution of Fare')
plt.xlabel('Fare')
plt.ylabel('Frequency')
plt.show()
```



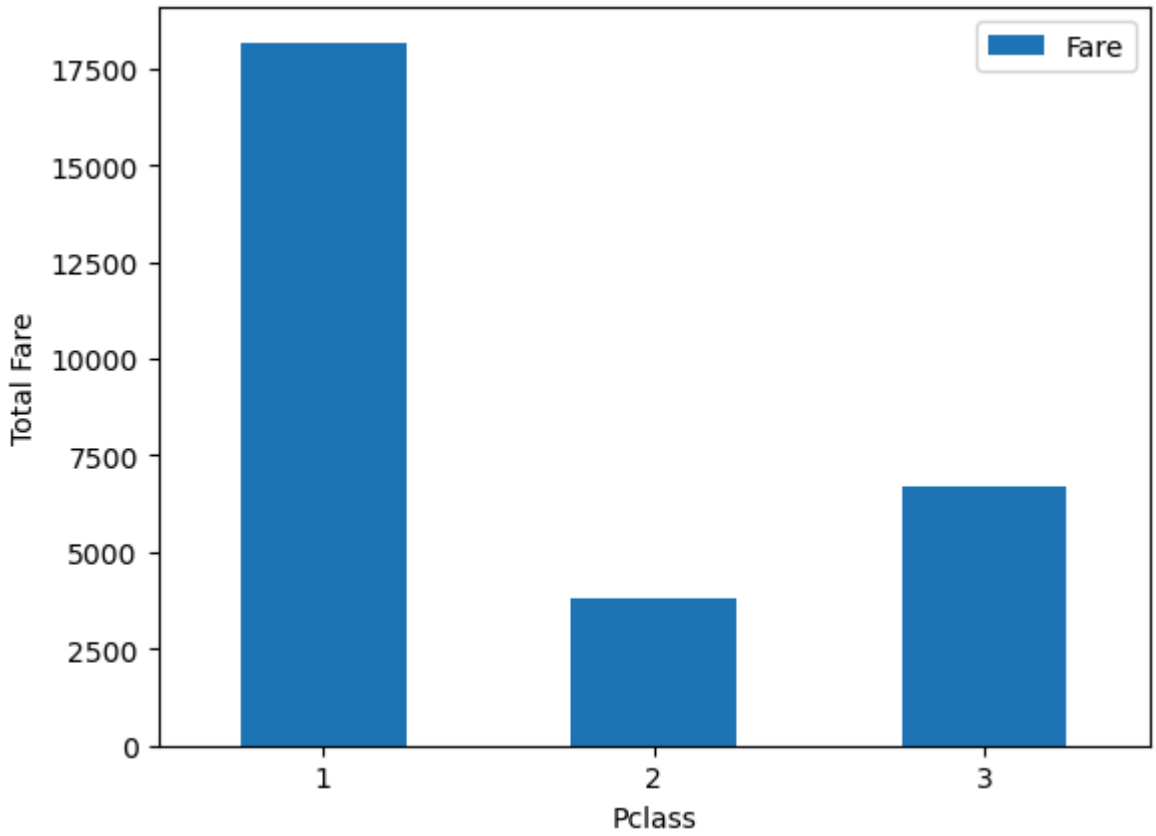
In [34]:
```
class_fare = train.pivot_table(index='Pclass', values='Fare')
class_fare.plot(kind='bar')
plt.xlabel('Pclass')
plt.ylabel('Avg. Fare')
plt.xticks(rotation=0)
plt.show()
```



In [35]:
```
class_fare = train.pivot_table(index='Pclass', values='Fare')
class_fare.plot(kind='pie', y='Fare', autopct='%1.1f%%', legend=False)
plt.ylabel('')
plt.show()
```



In [36]:
```
class_fare = train.pivot_table(index='Pclass', values='Fare', aggfunc=np.sum)
class_fare.plot(kind='bar')
plt.xlabel('Pclass')
plt.ylabel('Total Fare')
plt.xticks(rotation=0)
plt.show()
```



Data Preprocessing

In [37]:
```
train_len = len(train)
df = pd.concat([train, test], axis=0)
df = df.reset_index(drop=True)
df.head()
```

Out[37]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	
0	1	0.0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2
1	2	1.0	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2
2	3	1.0	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9
3	4	1.0	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1
4	5	0.0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0

In [38]:
```
df.tail()
```

Out[38]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket
1304	1305	NaN	3	Spector, Mr. Woolf	male	NaN	0	0	A.5. 3236
1305	1306	NaN	1	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758
1306	1307	NaN	3	Saether, Mr. Simon Sivertsen	male	38.5	0	0	SOTON/O.Q. 3101262
1307	1308	NaN	3	Ware, Mr. Frederick	male	NaN	0	0	359309
1308	1309	NaN	3	Peter, Master. Michael J	male	NaN	1	1	2668

In [39]:
```
df.isnull().sum()
```

Out[39]:
```
PassengerId       0
Survived        418
Pclass            0
Name              0
Sex               0
Age             263
SibSp             0
Parch             0
Ticket            0
Fare              1
Cabin          1014
Embarked          2
dtype: int64
```

In [40]:
```
df = df.drop(columns=['Cabin'], axis=1)
```

In [41]:
```
df['Age'].mean()
```

Out[41]:
```
29.881137667304014
```

In [42]:
```
df['Age'] = df['Age'].fillna(df['Age'].mean())
df['Fare'] = df['Fare'].fillna(df['Fare'].mean())
```

In [43]:
```
df['Embarked'].mode()[0]
```

Out[43]:
```
'S'
```

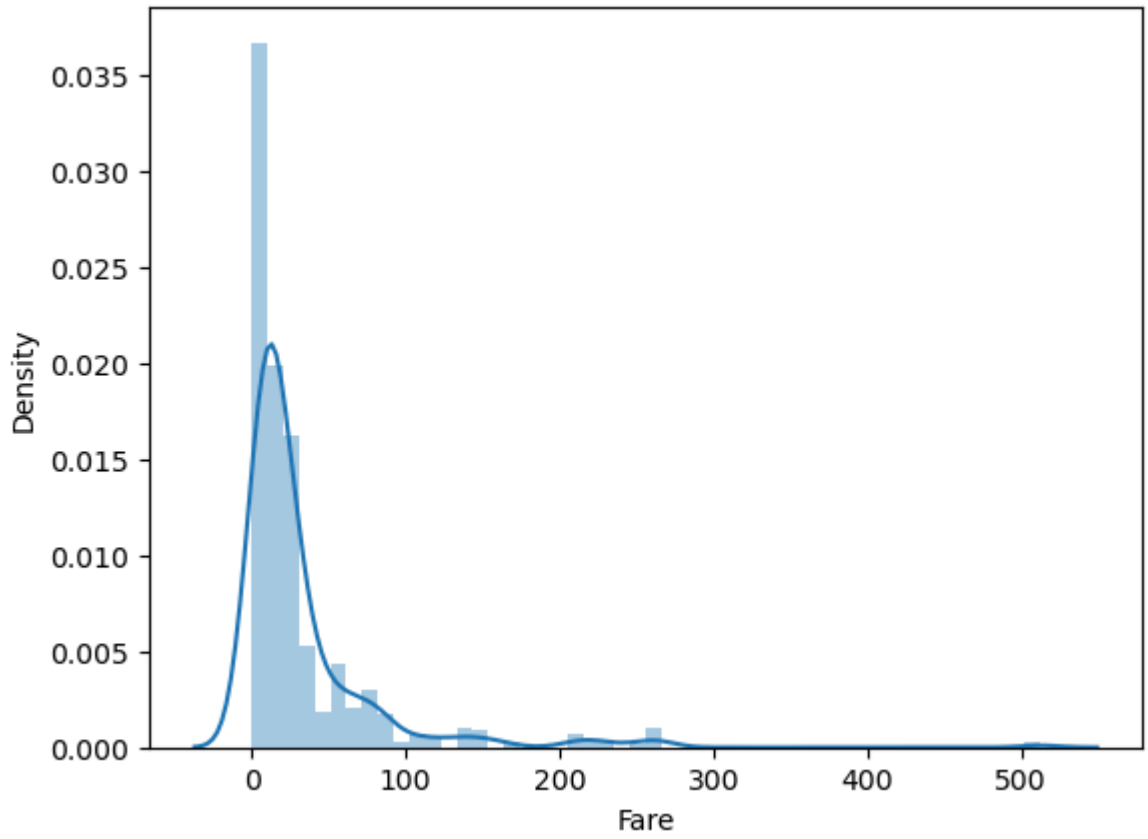
In [44]:
```
df['Embarked'] = df['Embarked'].fillna(df['Embarked'].mode()[0])
```

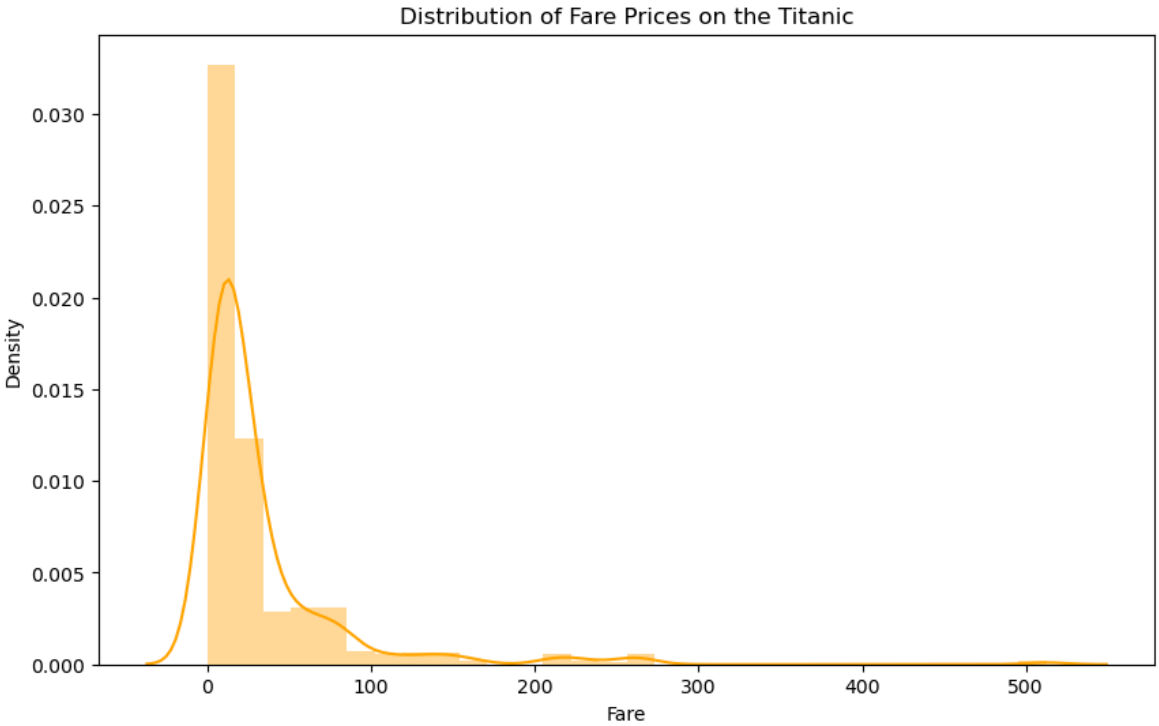
In [45]:
```
sns.distplot(df['Fare'])
```

Out[45]:
```
<Axes: xlabel='Fare', ylabel='Density'>
```

In [46]:
```
plt.figure(figsize=(10, 6))
sns.distplot(df['Fare'], bins=30, kde=True, color='orange')


plt.title('Distribution of Fare Prices on the Titanic')
plt.xlabel('Fare')
plt.ylabel('Density')
plt.show()
```

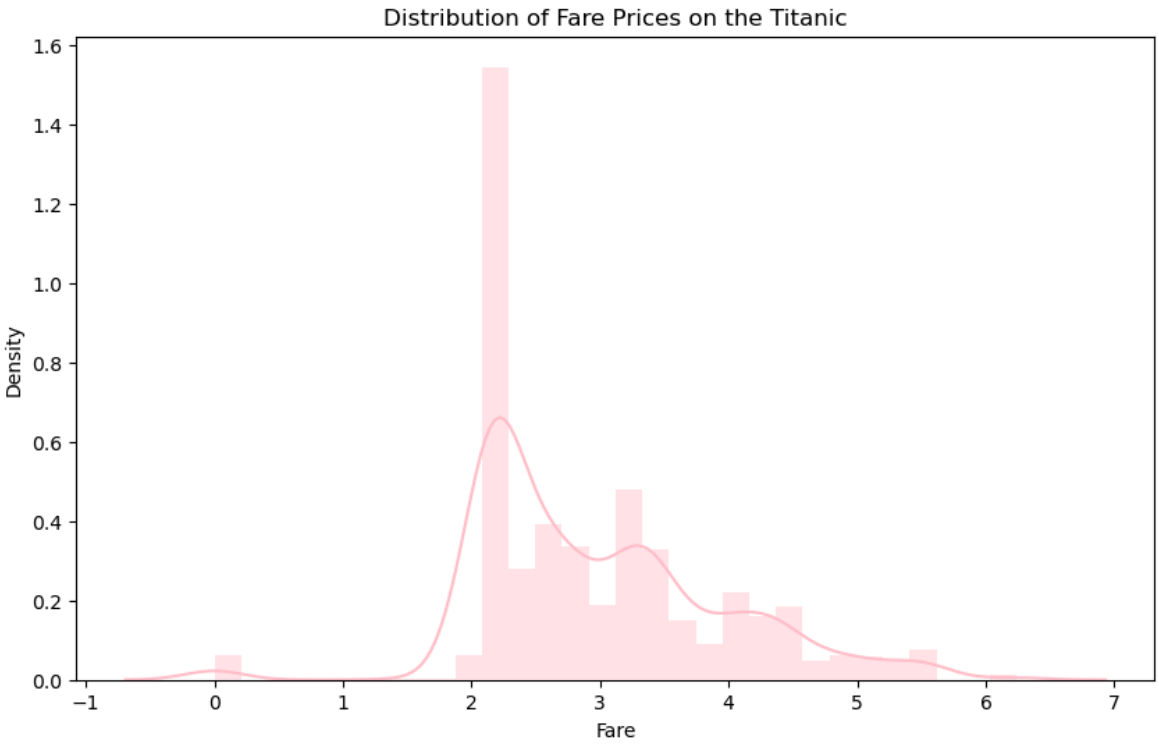




In [47]:
```
df['Fare'] = np.log(df['Fare']+1)
```

In [48]:
```
plt.figure(figsize=(10, 6))
sns.distplot(df['Fare'], bins=30, kde=True, color='pink')

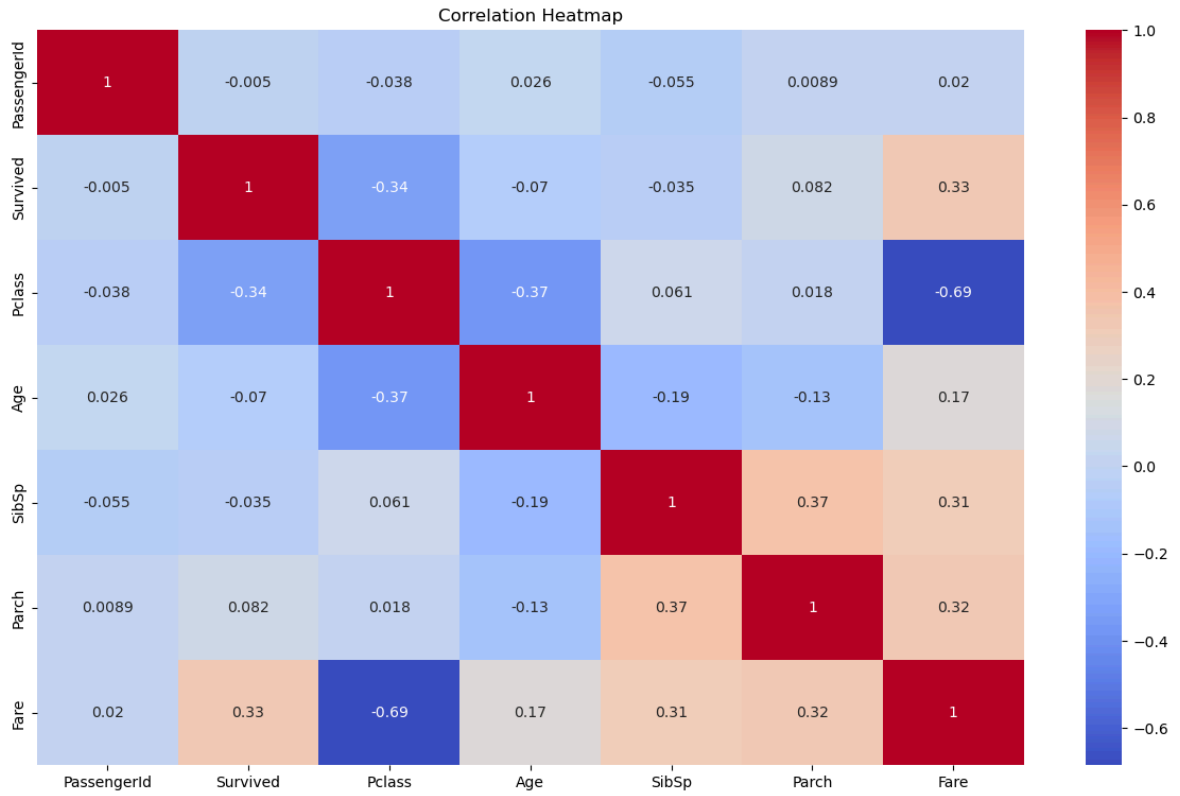

plt.title('Distribution of Fare Prices on the Titanic')
plt.xlabel('Fare')
plt.ylabel('Density')
plt.show()
```



Correlation Matrix

In [49]:
```
non_numeric_cols = df.select_dtypes(exclude=['number']).columns
print("Non-numeric columns:", non_numeric_cols)
df_numeric = df.drop(columns=non_numeric_cols)
corr = df_numeric.corr()
plt.figure(figsize=(15, 9))
sns.heatmap(corr, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

```
Non-numeric columns: Index(['Name', 'Sex', 'Ticket', 'Embarked'], dtype='object')
```



In [50]:
```
df.head()
```

Out[50]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	
0	1	0.0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	2.11
1	2	1.0	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	4.28
2	3	1.0	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	2.18
3	4	1.0	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	3.99
4	5	0.0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	2.20

In [51]:
```
df = df.drop(columns=['Name', 'Ticket'], axis=1)
df.head()
```

Out[51]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	1	0.0	3	male	22.0	1	0	2.110213	S
1	2	1.0	1	female	38.0	1	0	4.280593	C
2	3	1.0	3	female	26.0	0	0	2.188856	S
3	4	1.0	1	female	35.0	1	0	3.990834	S
4	5	0.0	3	male	35.0	0	0	2.202765	S

Label Coding

In [52]:
```
from sklearn.preprocessing import LabelEncoder
cols = ['Sex', 'Embarked']
le = LabelEncoder()

for col in cols:
    df[col] = le.fit_transform(df[col])
df.head()
```

Out[52]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	1	0.0	3	1	22.0	1	0	2.110213	2
1	2	1.0	1	0	38.0	1	0	4.280593	0
2	3	1.0	3	0	26.0	0	0	2.188856	2
3	4	1.0	1	0	35.0	1	0	3.990834	2
4	5	0.0	3	1	35.0	0	0	2.202765	2

Train-Test Split

In [53]:
```
train_len = int(0.8 * len(df))
train = df.iloc[:train_len, :]
test = df.iloc[train_len:, :]
```

In [54]:
```
train.head()
```

Out[54]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	1	0.0	3	1	22.0	1	0	2.110213	2
1	2	1.0	1	0	38.0	1	0	4.280593	0
2	3	1.0	3	0	26.0	0	0	2.188856	2
3	4	1.0	1	0	35.0	1	0	3.990834	2
4	5	0.0	3	1	35.0	0	0	2.202765	2

In [55]:
```
test.head()
```

Out[55]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
1047	1048	NaN	1	0	29.000000	0	0	5.406181	2
1048	1049	NaN	3	0	23.000000	0	0	2.180892	2
1049	1050	NaN	1	1	42.000000	0	0	3.316003	2
1050	1051	NaN	3	0	26.000000	0	2	2.692937	2
1051	1052	NaN	3	0	29.881138	0	0	2.167143	1

In [56]:
```
X = train.drop(columns=['PassengerId', 'Survived'], axis=1)
y = train['Survived']
```

In [57]:
```
X.head()
```

Out[57]:

	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	3	1	22.0	1	0	2.110213	2
1	1	0	38.0	1	0	4.280593	0
2	3	0	26.0	0	0	2.188856	2
3	1	0	35.0	1	0	3.990834	2
4	3	1	35.0	0	0	2.202765	2

Model Training

In [58]:
```
import pandas as pd
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.linear_model import LogisticRegression

# Load and preprocess the Titanic dataset
df = pd.read_csv('Titanic-Dataset.csv')

# Encode categorical variables to numeric values
df['Sex'] = df['Sex'].map({'male': 0, 'female': 1})  # Map 'male' to 0 and 'fema
df['Embarked'] = df['Embarked'].map({'C': 0, 'Q': 1, 'S': 2})  # Map 'C', 'Q', '

# Fill missing values in features with the median or mode
df['Age'].fillna(df['Age'].median(), inplace=True)
df['Fare'].fillna(df['Fare'].median(), inplace=True)
df['Embarked'].fillna(df['Embarked'].mode()[0], inplace=True)

# Handle missing target values (Survived)
df['Survived'].dropna(inplace=True)  # Drop rows where 'Survived' is NaN

# Define features (X) and target (y)
X = df[['Pclass', 'Sex', 'Age', 'SibSp', 'Parch', 'Fare', 'Embarked']]
y = df['Survived']

# Define the classify function
def classify(model):
```

```
    # Split data into training and testing sets
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, ra

    # Train the model
    model.fit(X_train, y_train)

    # Compute accuracy on the test set
    accuracy = model.score(X_test, y_test)
    print(f'Accuracy: {accuracy}')

    # Perform cross-validation
    cv_scores = cross_val_score(model, X_train, y_train, cv=5)  # 5-fold cross-v
    cv_score = cv_scores.mean()  # Mean of CV scores
    print(f'CV Score: {cv_score}')

# Initialize a model, e.g., Logistic Regression
model = LogisticRegression(max_iter=1000)

# Call the classify function with the model
classify(model)
```

```
Accuracy: 0.8071748878923767
CV Score: 0.7978453596678262
```

In [59]:
```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
classify(model)
```

```
Accuracy: 0.8071748878923767
CV Score: 0.7978453596678262
```

In [60]:
```
from sklearn.tree import DecisionTreeClassifier
model = DecisionTreeClassifier()
classify(model)
```

```
Accuracy: 0.726457399103139
CV Score: 0.7590730557737627
```

In [61]:
```
from sklearn.ensemble import ExtraTreesClassifier
model = ExtraTreesClassifier()
classify(model)
```

```
Accuracy: 0.7802690582959642
CV Score: 0.7889799124677366
```

In [62]:
```
pip install xgboost
```

```
Requirement already satisfied: xgboost in c:\users\saddi\anaconda3\lib\site-packa
ges (2.1.3)Note: you may need to restart the kernel to use updated packages.

Requirement already satisfied: numpy in c:\users\saddi\anaconda3\lib\site-package
s (from xgboost) (1.26.4)
Requirement already satisfied: scipy in c:\users\saddi\anaconda3\lib\site-package
s (from xgboost) (1.13.1)
```

In [63]:
```
from xgboost import XGBClassifier
model = XGBClassifier()
classify(model)
```

```
Accuracy: 0.7892376681614349
CV Score: 0.79947256200202
```

In [64]:
```
pip install lightgbm
```

```
Requirement already satisfied: lightgbm in c:\users\saddi\anaconda3\lib\site-pack
ages (4.5.0)
Requirement already satisfied: numpy>=1.17.0 in c:\users\saddi\anaconda3\lib\site
-packages (from lightgbm) (1.26.4)
Requirement already satisfied: scipy in c:\users\saddi\anaconda3\lib\site-package
s (from lightgbm) (1.13.1)
Note: you may need to restart the kernel to use updated packages.
```

In [65]:
```
from lightgbm import LGBMClassifier
model = LGBMClassifier()
classify(model)
```

```
  File "C:\Users\saddi\anaconda3\Lib\site-packages\joblib\externals\loky\backend
\context.py", line 282, in _count_physical_cores
    raise ValueError(f"found {cpu_count_physical} physical cores < 1")
```

```
[LightGBM] [Info] Number of positive: 253, number of negative: 415
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing
was 0.000166 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 190
[LightGBM] [Info] Number of data points in the train set: 668, number of used fea
tures: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.378743 -> initscore=-0.494889
[LightGBM] [Info] Start training from score -0.494889
[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
Accuracy: 0.820627802690583
[LightGBM] [Info] Number of positive: 202, number of negative: 332
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing
was 0.000137 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 174
[LightGBM] [Info] Number of data points in the train set: 534, number of used fea
tures: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.378277 -> initscore=-0.496867
```

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[LightGBM] [Info] Start training from score -0.496867
[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] [Info] Number of positive: 202, number of negative: 332
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing
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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 170
[LightGBM] [Info] Number of data points in the train set: 534, number of used fea
tures: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.378277 -> initscore=-0.496867
[LightGBM] [Info] Start training from score -0.496867
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[LightGBM] [Info] Number of positive: 202, number of negative: 332
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing
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[LightGBM] [Info] Number of data points in the train set: 534, number of used fea
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[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
CV Score: 0.8248905846706318
```

In [66]:
```
!pip install catboost
from catboost import CatBoostClassifier
model = CatBoostClassifier(verbose=0)
classify(model)
```

```
Requirement already satisfied: catboost in c:\users\saddi\anaconda3\lib\site-pack
ages (1.2.7)
Requirement already satisfied: graphviz in c:\users\saddi\anaconda3\lib\site-pack
ages (from catboost) (0.20.3)
Requirement already satisfied: matplotlib in c:\users\saddi\anaconda3\lib\site-pa
ckages (from catboost) (3.9.2)
Requirement already satisfied: numpy<2.0,>=1.16.0 in c:\users\saddi\anaconda3\lib
\site-packages (from catboost) (1.26.4)
Requirement already satisfied: pandas>=0.24 in c:\users\saddi\anaconda3\lib\site-
packages (from catboost) (2.2.2)
Requirement already satisfied: scipy in c:\users\saddi\anaconda3\lib\site-package
s (from catboost) (1.13.1)
Requirement already satisfied: plotly in c:\users\saddi\anaconda3\lib\site-packag
es (from catboost) (5.24.1)
Requirement already satisfied: six in c:\users\saddi\anaconda3\lib\site-packages
(from catboost) (1.16.0)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\saddi\anaconda3
\lib\site-packages (from pandas>=0.24->catboost) (2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in c:\users\saddi\anaconda3\lib\site-
packages (from pandas>=0.24->catboost) (2024.1)
Requirement already satisfied: tzdata>=2022.7 in c:\users\saddi\anaconda3\lib\sit
e-packages (from pandas>=0.24->catboost) (2023.3)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\saddi\anaconda3\lib\s
ite-packages (from matplotlib->catboost) (1.2.0)
Requirement already satisfied: cycler>=0.10 in c:\users\saddi\anaconda3\lib\site-
packages (from matplotlib->catboost) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\saddi\anaconda3\lib
\site-packages (from matplotlib->catboost) (4.51.0)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\saddi\anaconda3\lib
\site-packages (from matplotlib->catboost) (1.4.4)
Requirement already satisfied: packaging>=20.0 in c:\users\saddi\anaconda3\lib\si
te-packages (from matplotlib->catboost) (24.1)
Requirement already satisfied: pillow>=8 in c:\users\saddi\anaconda3\lib\site-pac
kages (from matplotlib->catboost) (10.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\saddi\anaconda3\lib\s
ite-packages (from matplotlib->catboost) (3.1.2)
Requirement already satisfied: tenacity>=6.2.0 in c:\users\saddi\anaconda3\lib\si
te-packages (from plotly->catboost) (8.2.3)
Accuracy: 0.8340807174887892
CV Score: 0.8203905285602063
```

Complete Model Training with Full Data

In [77]:
```
model = LGBMClassifier()
model.fit(X, y)
```

```
[LightGBM] [Info] Number of positive: 342, number of negative: 549
[LightGBM] [Info] Auto-choosing row-wise multi-threading, the overhead of testing
was 0.000262 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 221
[LightGBM] [Info] Number of data points in the train set: 891, number of used fea
tures: 7
[LightGBM] [Info] [binary:BoostFromScore]: pavg=0.383838 -> initscore=-0.473288
[LightGBM] [Info] Start training from score -0.473288
[LightGBM] [Warning] No further splits with positive gain, best gain: -inf
```

Out[77]:

LGBMClassifier

LGBMClassifier()

In [78]:
```
test.head()
```

Out[78]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
1047	1048	NaN	1	0	29.000000	0	0	5.406181	2
1048	1049	NaN	3	0	23.000000	0	0	2.180892	2
1049	1050	NaN	1	1	42.000000	0	0	3.316003	2
1050	1051	NaN	3	0	26.000000	0	2	2.692937	2
1051	1052	NaN	3	0	29.881138	0	0	2.167143	1

In [79]:
```
X_test = test.drop(columns=['PassengerId', 'Survived'], axis=1)
```

In [80]:
```
X_test.head()
```

Out[80]:

	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
1047	1	0	29.000000	0	0	5.406181	2
1048	3	0	23.000000	0	0	2.180892	2
1049	1	1	42.000000	0	0	3.316003	2
1050	3	0	26.000000	0	2	2.692937	2
1051	3	0	29.881138	0	0	2.167143	1

In [81]:
```
pred = model.predict(X_test)
pred
```

Out[81]:
```
array([0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1,
       0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0,
       0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0,
       0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0,
       0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0,
       1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 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, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0,
       0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0,
       1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0],
      dtype=int64)
```

In [82]:
```
sub = pd.read_csv('gender_submission.csv')
sub.head()
```

Out[82]:

	PassengerId	Survived
0	892	0
1	893	1
2	894	0
3	895	0
4	896	1

In [83]:
```
sub.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 2 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  418 non-null    int64
 1   Survived     418 non-null    int64
dtypes: int64(2)
memory usage: 6.7 KB
```

In [84]:
```
sub.head()
```

Out[84]:

	PassengerId	Survived
0	892	0
1	893	1
2	894	0
3	895	0
4	896	1

In [85]:
```
sub.to_csv('submission.csv', index=False)
```

In [88]:
```
y_pred = voting_model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
```

```
print(f" Final Accuracy: {accuracy * 100:.2f}%")
```

```
Final Accuracy: 88.18%
```