TITANIC

March 5, 2025

1 Titanic dataset analysis

1.0.1 This homework involves cleanning and show high level analysis of the Titanic dataset. The dataset is available in Kaggle. The dataset contains information about the passengers of the Titanic, such as their age, class, fare, etc.

1.0.2 1. Import and clean the dataset

[86]:
```
# Import libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
import warnings
warnings.simplefilter("ignore", category=SyntaxWarning)
warnings.simplefilter("ignore", category=FutureWarning)
```

[87]:
```
titanic_df = pd.read_csv("./assets/Datos Titanic/datoslimpios.csv",␣
  ↪encoding="latin1", on_bad_lines="warn")
titanic_df.head()
```

[87]:
```
   PassengerId  Survived  Pclass       Name  \
0            1         0       3     Braund
1            2         1       1    Cumings
2            3         1       3  Heikkinen
3            4         1       1   Futrelle
4            5         0       3      Allen

                                      Lastname     Sex   Age  SibSp  Parch  \
0                              Mr. Owen Harris    male  22.0      1      0
1   Mrs. John Bradley (Florence Briggs Thayer)  female  38.0      1      0
2                                  Miss. Laina  female  26.0      0      0
3           Mrs. Jacques Heath (Lily May Peel)  female  35.0      1      0
4                            Mr. William Henry    male  35.0      0      0

             Ticket     Fare Embarked
```

```
0         A/5 21171   7.2500        S
1          PC 17599  71.2833        C
2  STON/O2. 3101282   7.9250        S
3            113803  53.1000        S
4            373450   8.0500        S
```

```
[88]: titanic_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   Lastname     891 non-null    object
 5   Sex          891 non-null    object
 6   Age          891 non-null    float64
 7   SibSp        891 non-null    int64
 8   Parch        891 non-null    int64
 9   Ticket       891 non-null    object
 10  Fare         891 non-null    float64
 11  Embarked     891 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

```
[89]: titanic_df.columns
```

```
[89]: Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Lastname', 'Sex', 'Age',
             'SibSp', 'Parch', 'Ticket', 'Fare', 'Embarked'],
            dtype='object')
```

```
[90]: numeric_columns = titanic_df.select_dtypes(include=['int64', 'float64']).columns
      numeric_df = titanic_df[numeric_columns]
      numeric_df.describe()
```

```
[90]:        PassengerId    Survived      Pclass         Age       SibSp  \
      count   891.000000  891.000000  891.000000  891.000000  891.000000
      mean    446.000000    0.383838    2.308642   29.385152    0.523008
      std     257.353842    0.486592    0.836071   13.259656    1.102743
      min       1.000000    0.000000    1.000000    0.420000    0.000000
      25%     223.500000    0.000000    2.000000   21.000000    0.000000
      50%     446.000000    0.000000    3.000000   30.000000    0.000000
      75%     668.500000    1.000000    3.000000   35.000000    1.000000
      max     891.000000    1.000000    3.000000   80.000000    8.000000
```

```
           Parch        Fare
count  891.000000  891.000000
mean     0.381594   32.204208
std      0.806057   49.693429
min      0.000000    0.000000
25%      0.000000    7.910400
50%      0.000000   14.454200
75%      0.000000   31.000000
max      6.000000  512.329200
```

[91]:
```
df_numeric = titanic_df[['Survived', 'Pclass', 'Age', 'SibSp', 'Parch', 'Fare']]
```

[92]:
```
tendencia_central = df_numeric.describe().applymap(lambda x: f"{x:0.3f}")
tendencia_central
```

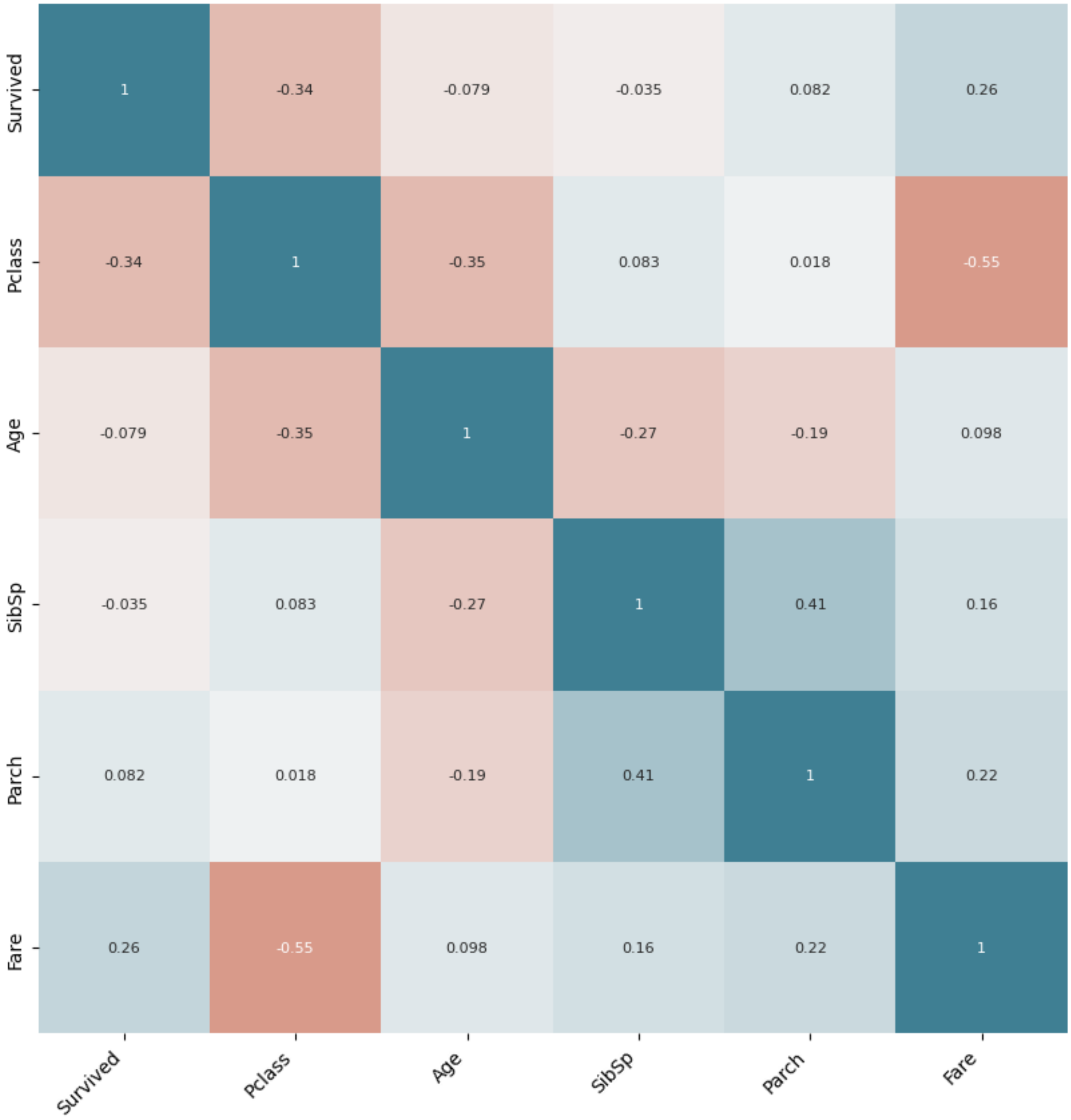
[92]:
```
      Survived   Pclass      Age    SibSp    Parch     Fare
count  891.000  891.000  891.000  891.000  891.000  891.000
mean     0.384    2.309   29.385    0.523    0.382   32.204
std      0.487    0.836   13.260    1.103    0.806   49.693
min      0.000    1.000    0.420    0.000    0.000    0.000
25%      0.000    2.000   21.000    0.000    0.000    7.910
50%      0.000    3.000   30.000    0.000    0.000   14.454
75%      1.000    3.000   35.000    1.000    0.000   31.000
max      1.000    3.000   80.000    8.000    6.000  512.329
```

[93]:
```
df_numeric.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Survived  891 non-null    int64
 1   Pclass    891 non-null    int64
 2   Age       891 non-null    float64
 3   SibSp     891 non-null    int64
 4   Parch     891 non-null    int64
 5   Fare      891 non-null    float64
dtypes: float64(2), int64(4)
memory usage: 41.9 KB
```

[94]:
```
corr_matrix = df_numeric.corr(method='pearson')
# Print corr matrix as a pretty chart of big size

fig, ax = plt.subplots(nrows=1, ncols=1, figsize=(10, 10))
sns.heatmap(corr_matrix,annot=True,cbar=False,annot_kws = {"size":
 ↪8},vmin=-1,vmax=1,center=0,
cmap=sns.diverging_palette(20, 220, n=200), square=True,ax=ax)
```

```
ax.set_xticklabels(ax.get_xticklabels(),rotation = 45,horizontalalignment =␣
 ↪'right',)
ax.tick_params(labelsize = 10)
```

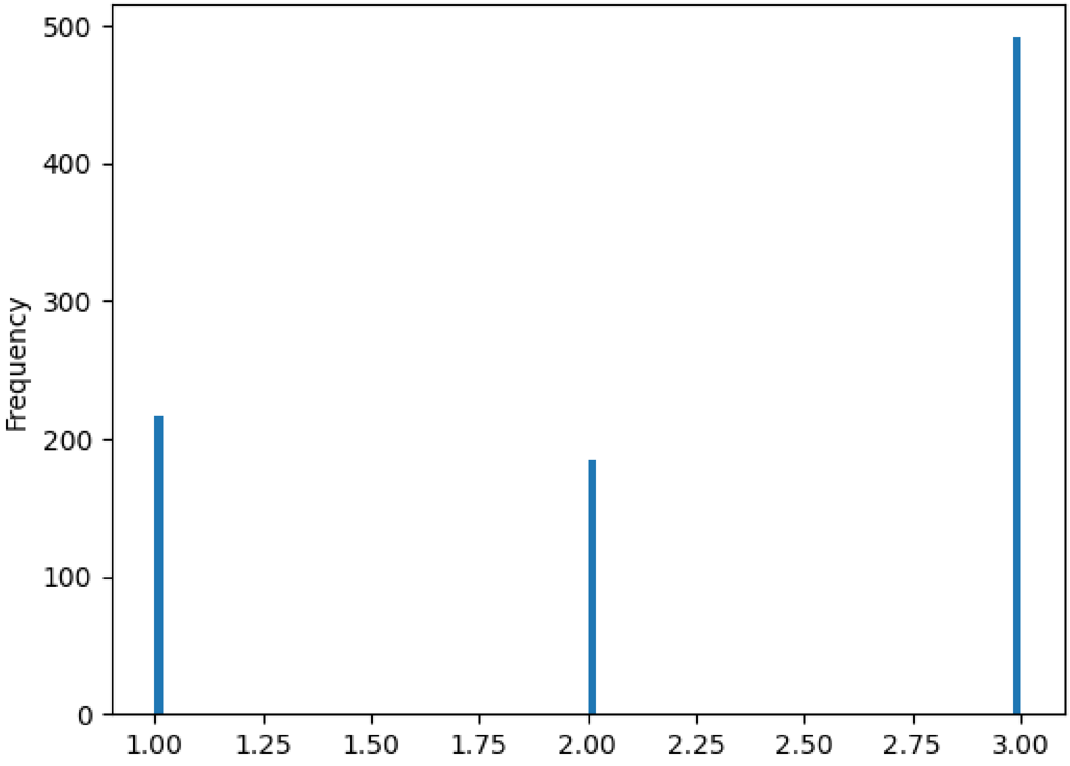


[96]:
```
# Plot frequency distribution of each column in df_numeric
df_numeric['Pclass'] = df_numeric['Pclass'].astype('int')
df_numeric['Pclass'].plot.hist(bins=100)
```

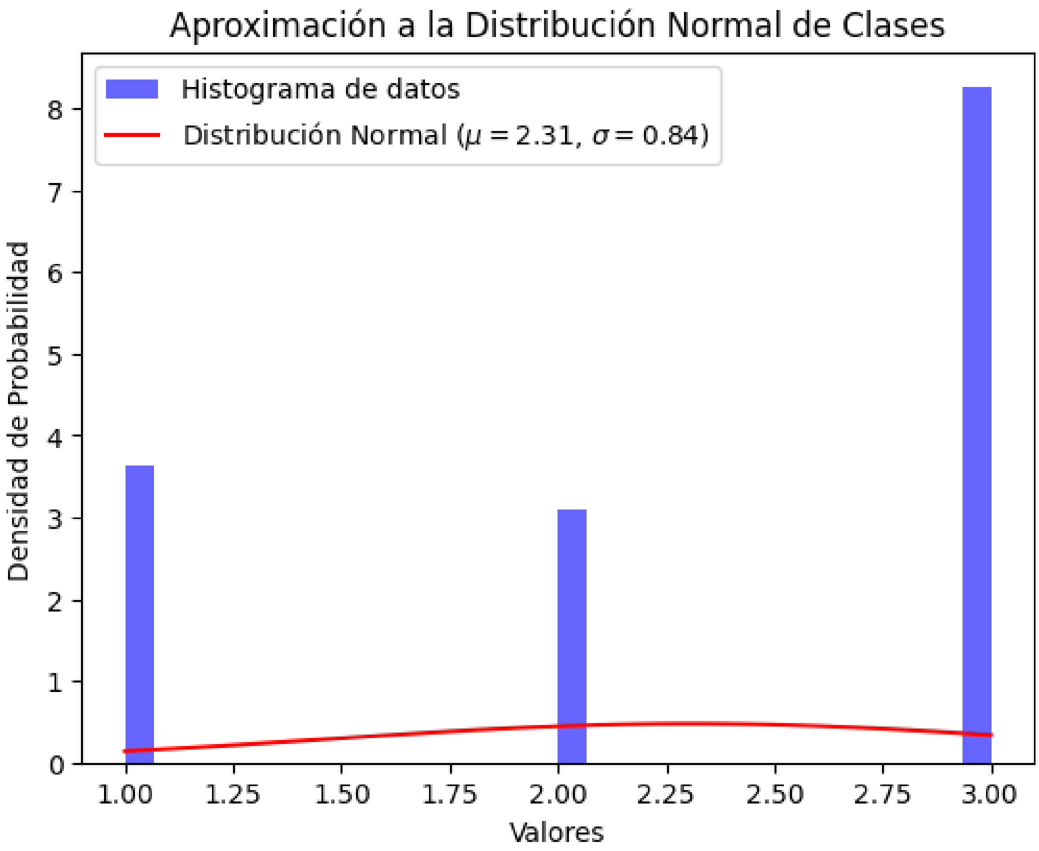
```
/var/folders/cg/l549l5jn7ql8v5_67ml6_p2m0000gn/T/ipykernel_9573/2914623054.py:2:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df_numeric['Pclass'] = df_numeric['Pclass'].astype('int')
```

[96]:
```
<Axes: ylabel='Frequency'>
```



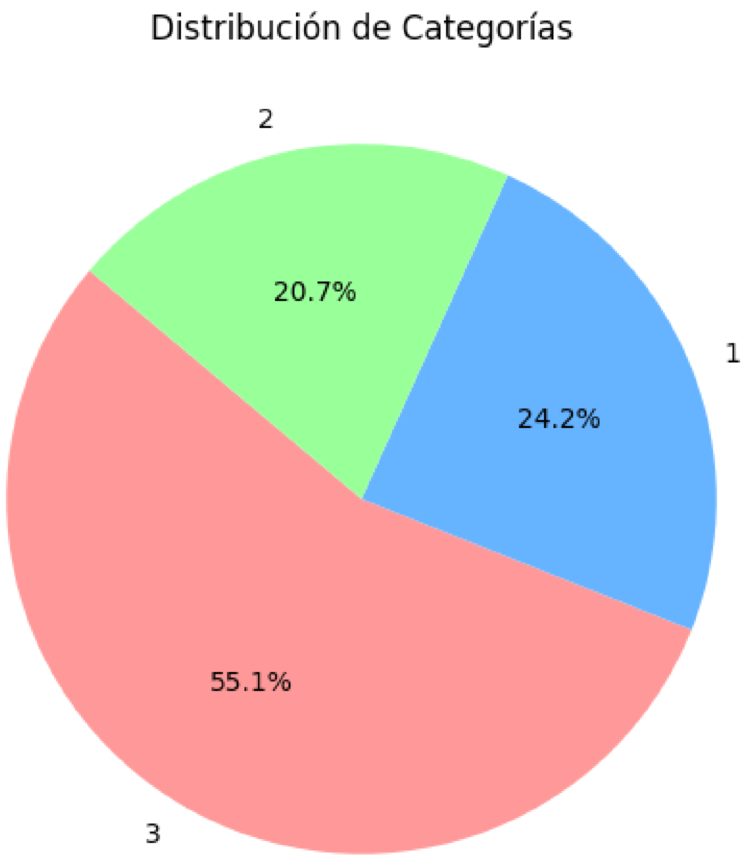
[97]:
```
# Estimar parámetros de la distribución normal
mu, sigma = np.mean(df_numeric['Pclass']), np.std(df_numeric['Pclass'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['Pclass']), max(df_numeric['Pclass']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['Pclass'], bins=30, density=True, alpha=0.6, color='b',␣
 ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
 ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal de Clases')
plt.legend()
plt.show()
```



[98]:
```
lista_valores = df_numeric['Pclass'].to_list()
resultados = {x: lista_valores.count(x) for x in lista_valores}
list(resultados.keys())
```

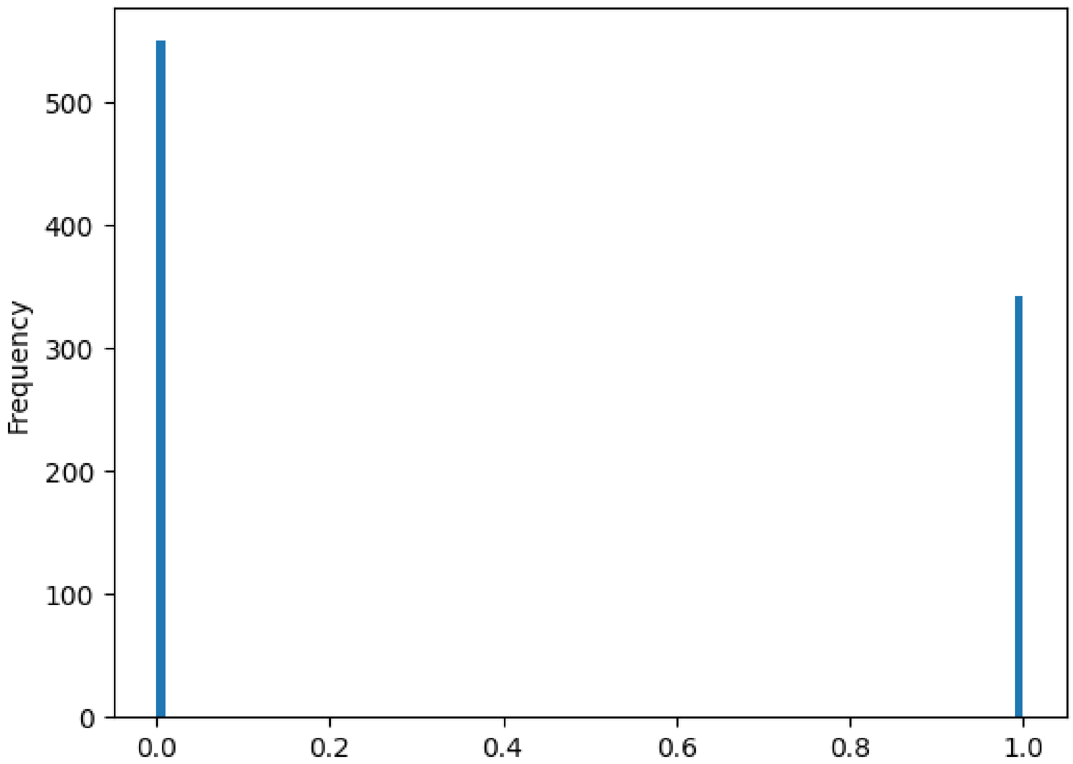
[98]:
```
[3, 1, 2]
```

[99]:
```
plt.figure(figsize=(8, 6))
plt.pie(list(resultados.values()), labels=list(resultados.keys()), autopct='%1.
  ↪1f%%', startangle=140,␣
  ↪colors=['#ff9999','#66b3ff','#99ff99','#ffcc99','#c2c2f0'])
plt.title("Distribución de Categorías")
plt.show()
```



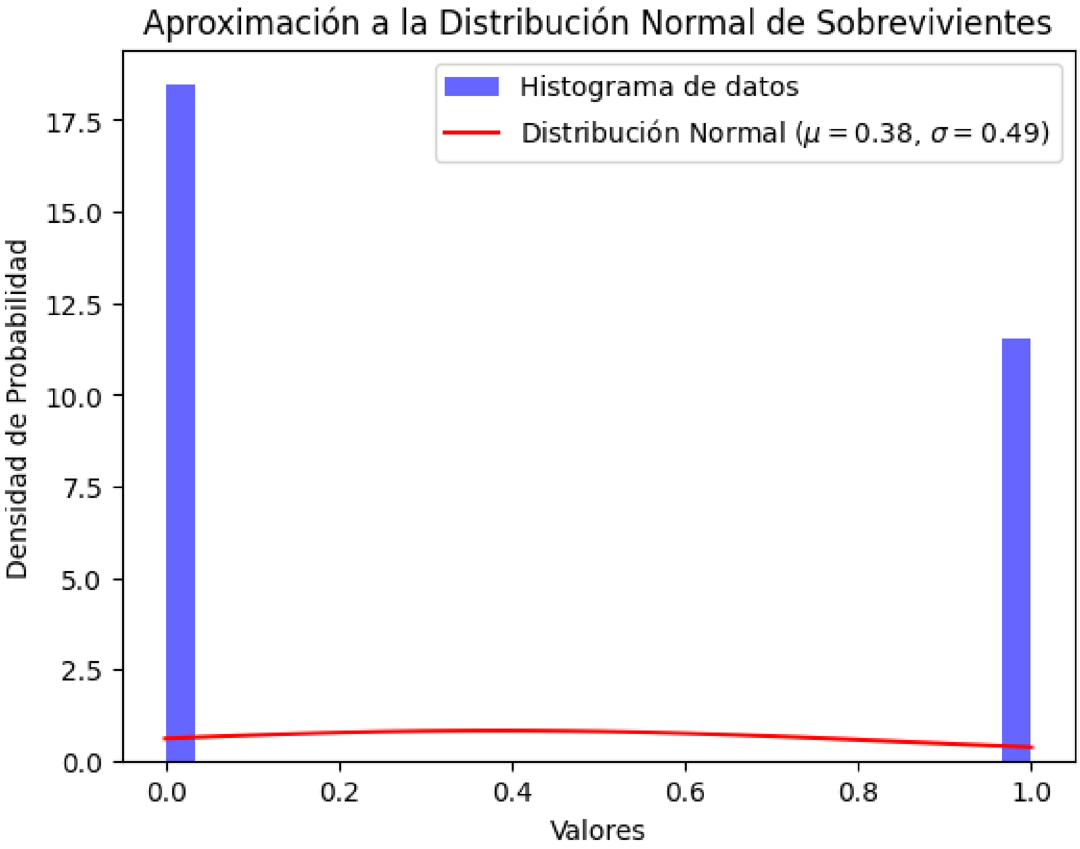
```
[100]: df_numeric['Survived'].plot.hist(bins=100)
```

```
[100]: <Axes: ylabel='Frequency'>
```



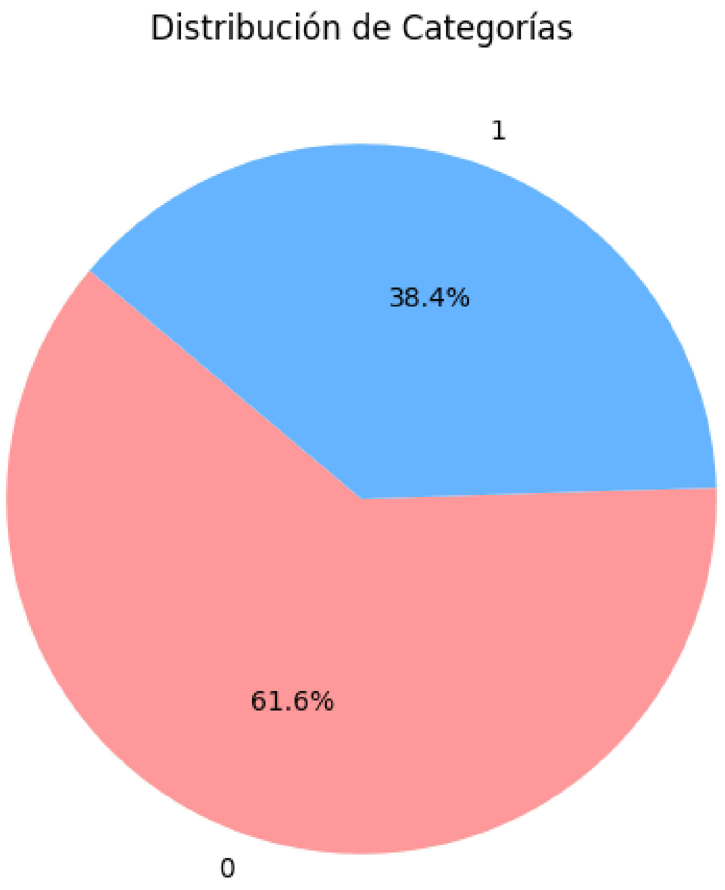
[101]:

```
# Estimar parámetros de la distribución normal
mu, sigma = np.mean(df_numeric['Survived']), np.std(df_numeric['Survived'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['Survived']), max(df_numeric['Survived']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['Survived'], bins=30, density=True, alpha=0.6, color='b',␣
  ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
  ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal de Sobrevivientes')
plt.legend()
plt.show()
```



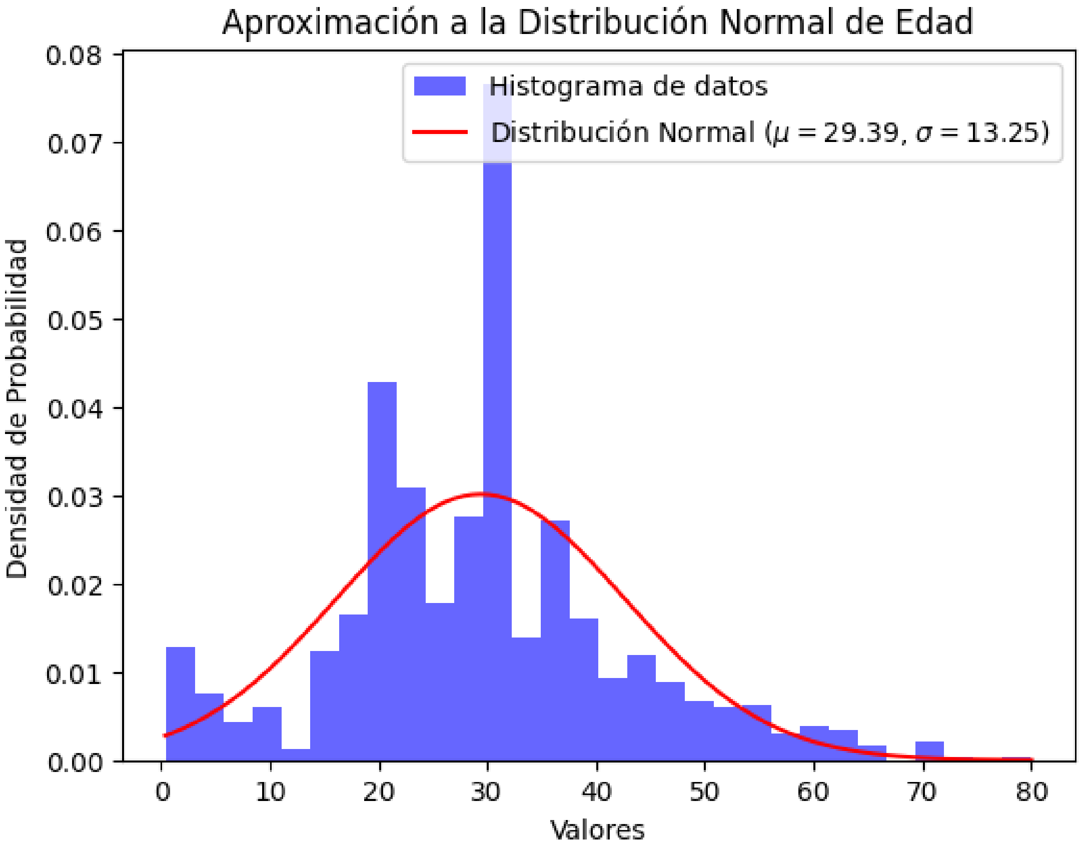
[102]:

```
lista_valores = df_numeric['Survived'].to_list()
resultados = {x: lista_valores.count(x) for x in lista_valores}
list(resultados.keys())
plt.figure(figsize=(8, 6))
plt.pie(list(resultados.values()), labels=list(resultados.keys()), autopct='%1.
 ↪1f%%', startangle=140,␣
 ↪colors=['#ff9999','#66b3ff','#99ff99','#ffcc99','#c2c2f0'])
plt.title("Distribución de Categorías")
plt.show()
```



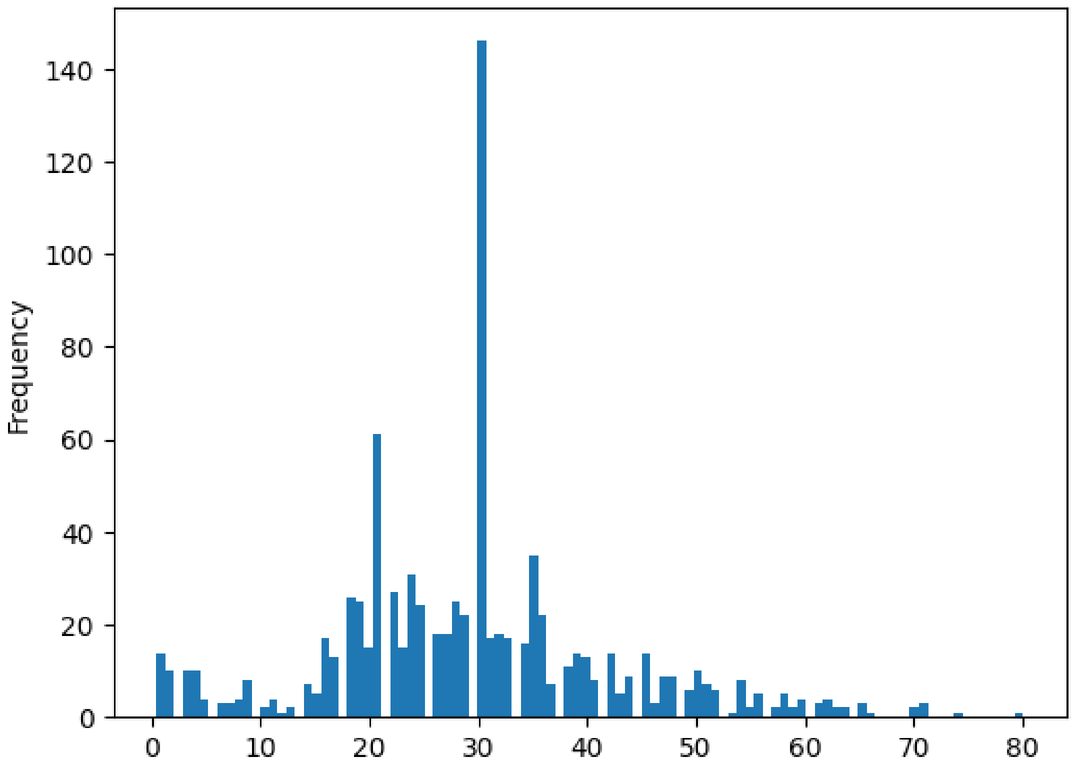
```
[103]: import scipy.stats as stats
```

```
[104]: # Estimar parámetros de la distribución normal

mu, sigma = np.mean(df_numeric['Age']), np.std(df_numeric['Age'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['Age']), max(df_numeric['Age']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['Age'], bins=30, density=True, alpha=0.6, color='b',␣
 ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
 ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal de Edad')
plt.legend()
plt.show()
```



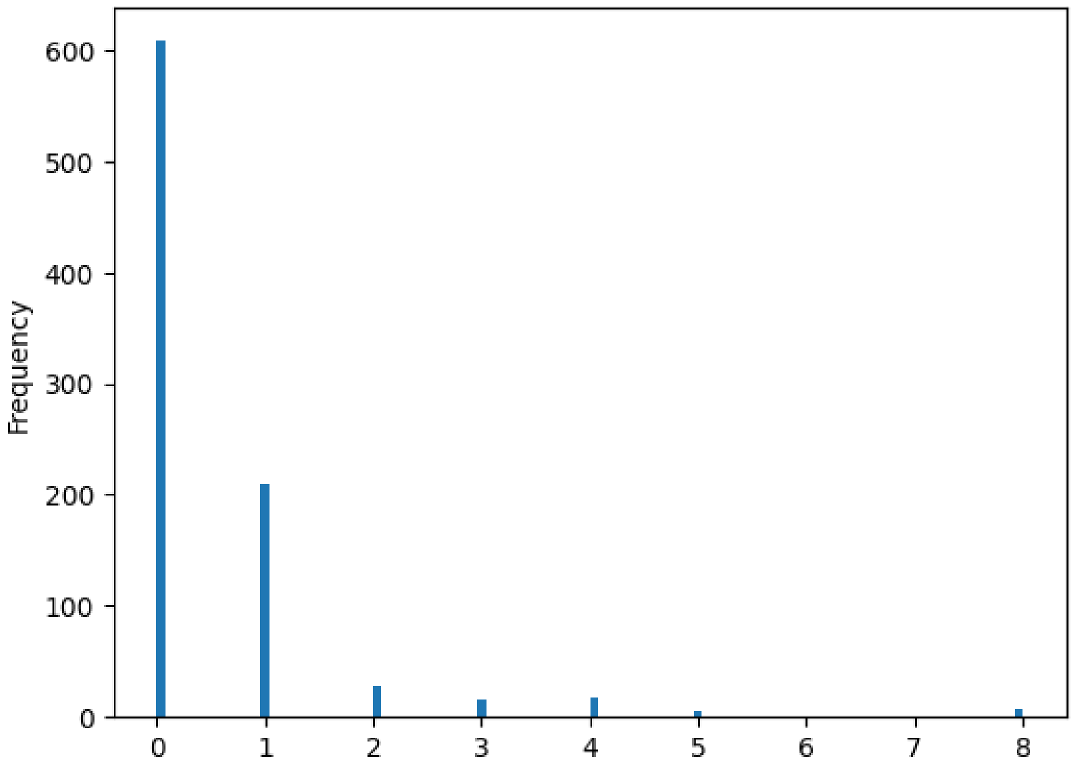
```
[105]: df_numeric['Age'].plot.hist(bins=100)
```

```
[105]: <Axes: ylabel='Frequency'>
```



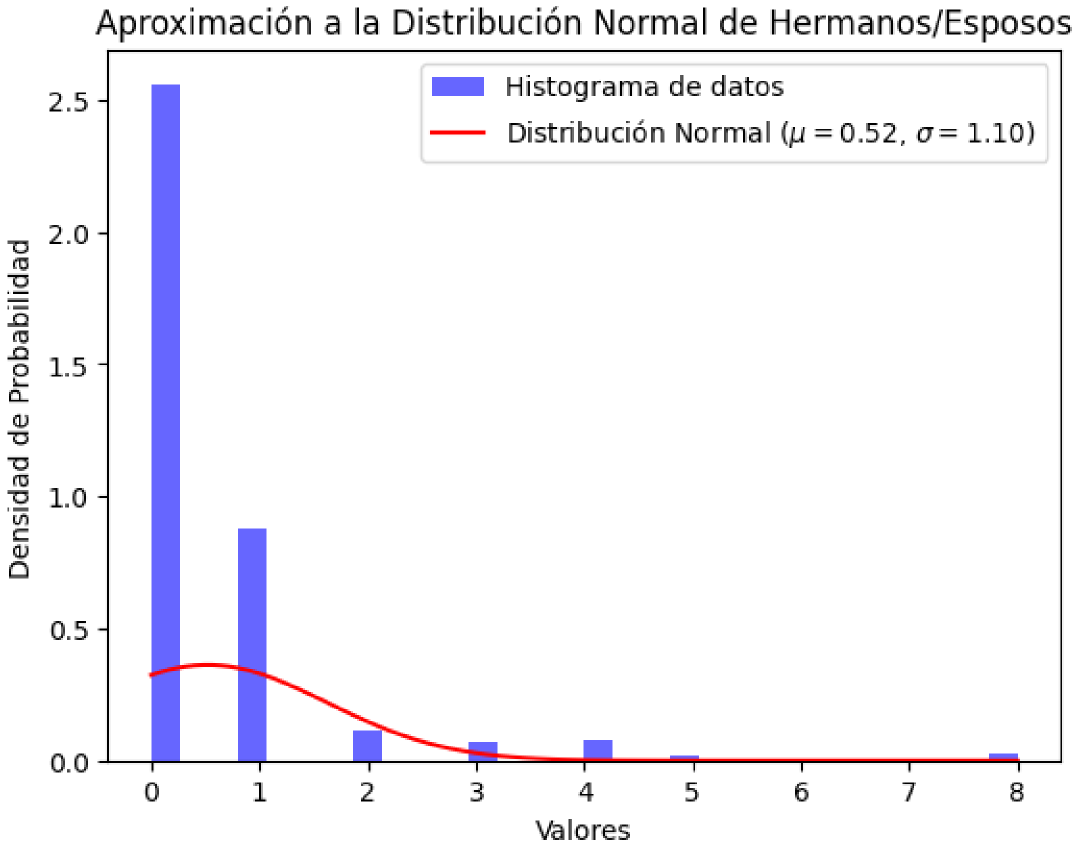
[106]:
```
# Plot frequency distribution of each column in df_numeric
df_numeric['SibSp'].plot.hist(bins=100)
```

[106]:
```
<Axes: ylabel='Frequency'>
```



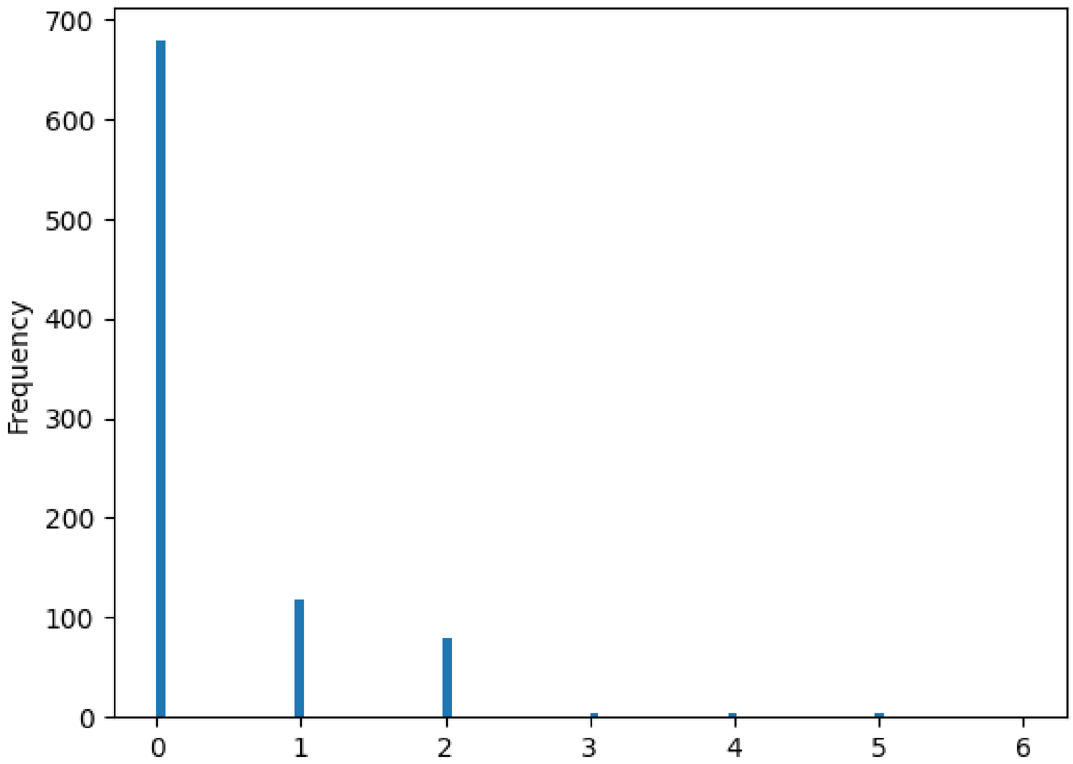
[107]:

```
# Estimar parámetros de la distribución normal
mu, sigma = np.mean(df_numeric['SibSp']), np.std(df_numeric['SibSp'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['SibSp']), max(df_numeric['SibSp']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['SibSp'], bins=30, density=True, alpha=0.6, color='b',␣
 ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
 ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal de Hermanos/Esposos')
plt.legend()
plt.show()
```

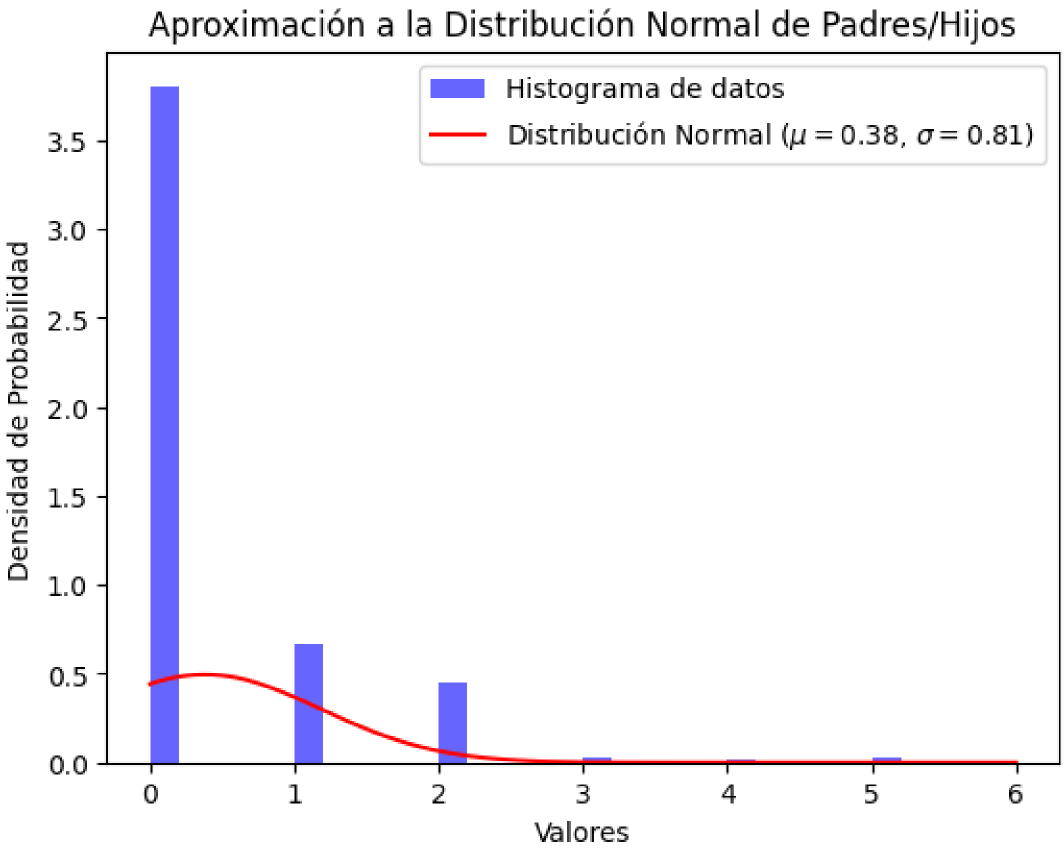


```
[108]: # Plot frequency distribution of each column in df_numeric
       df_numeric['Parch'].plot.hist(bins=100)
```

```
[108]: <Axes: ylabel='Frequency'>
```

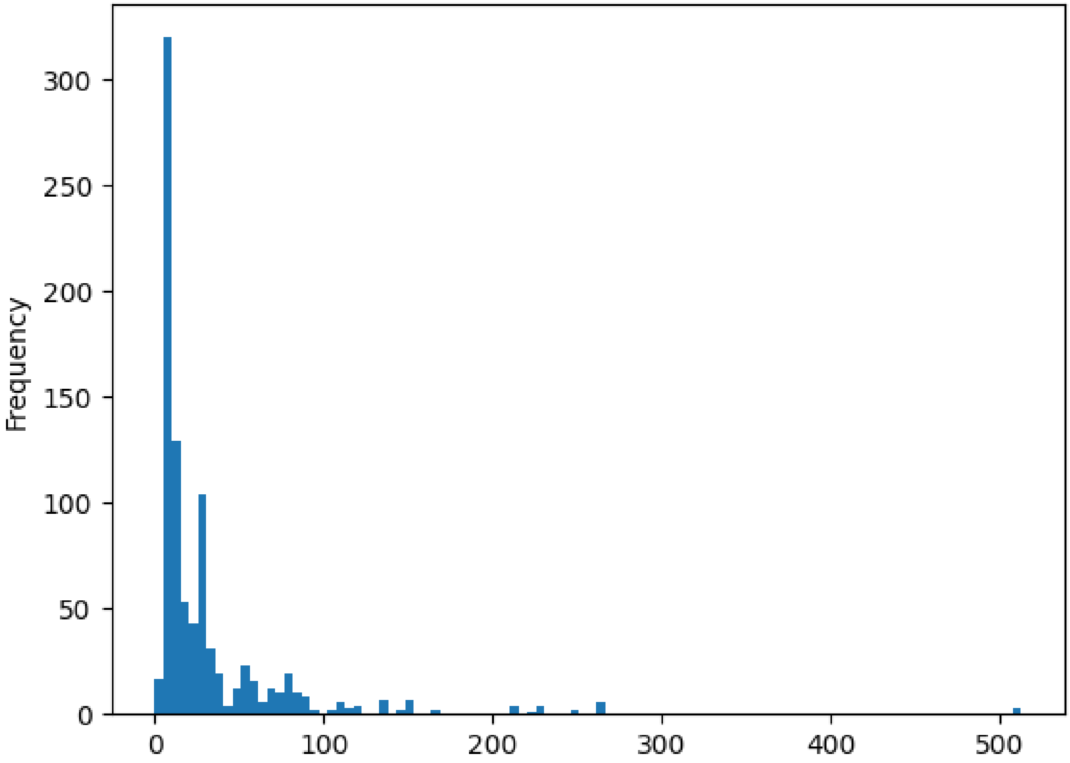


[109]:
```
# Estimar parámetros de la distribución normal
mu, sigma = np.mean(df_numeric['Parch']), np.std(df_numeric['Parch'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['Parch']), max(df_numeric['Parch']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['Parch'], bins=30, density=True, alpha=0.6, color='b',␣
 ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
 ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal de Padres/Hijos')
plt.legend()
plt.show()
```

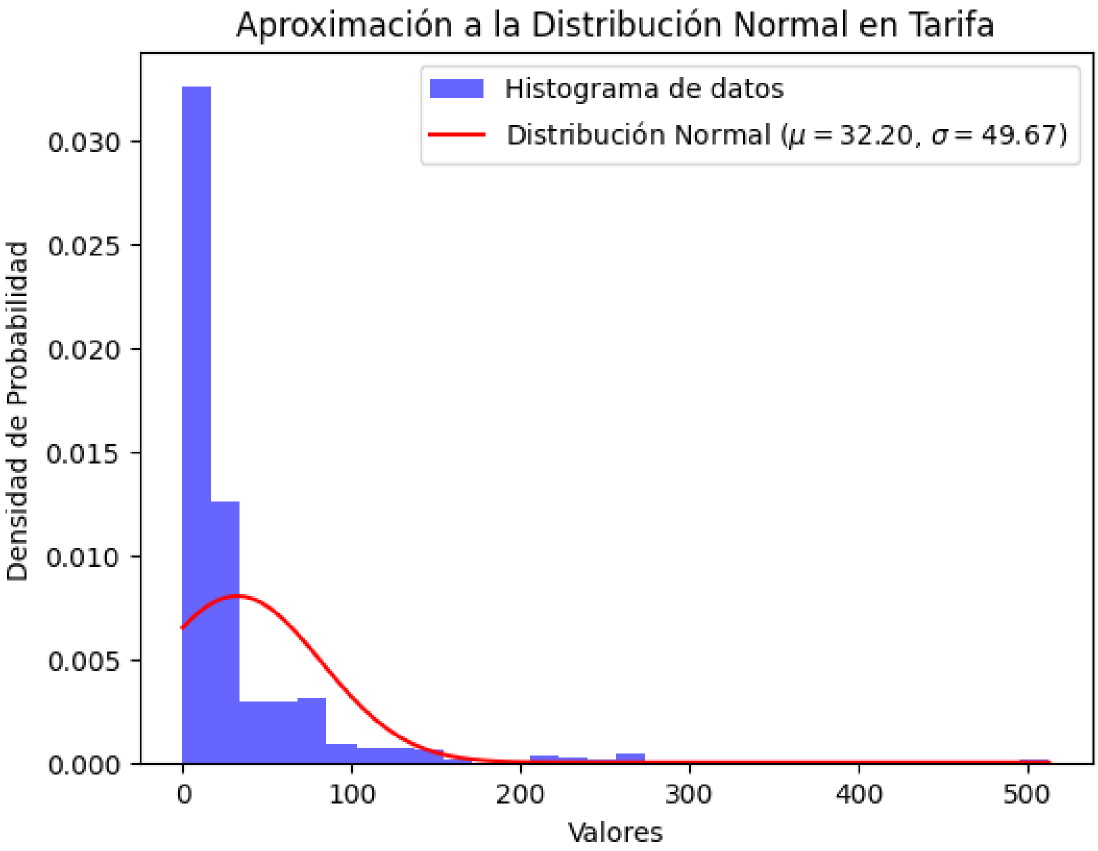


```
[110]: # Plot frequency distribution of each column in df_numeric
       df_numeric['Fare'].plot.hist(bins=100)
```

```
[110]: <Axes: ylabel='Frequency'>
```

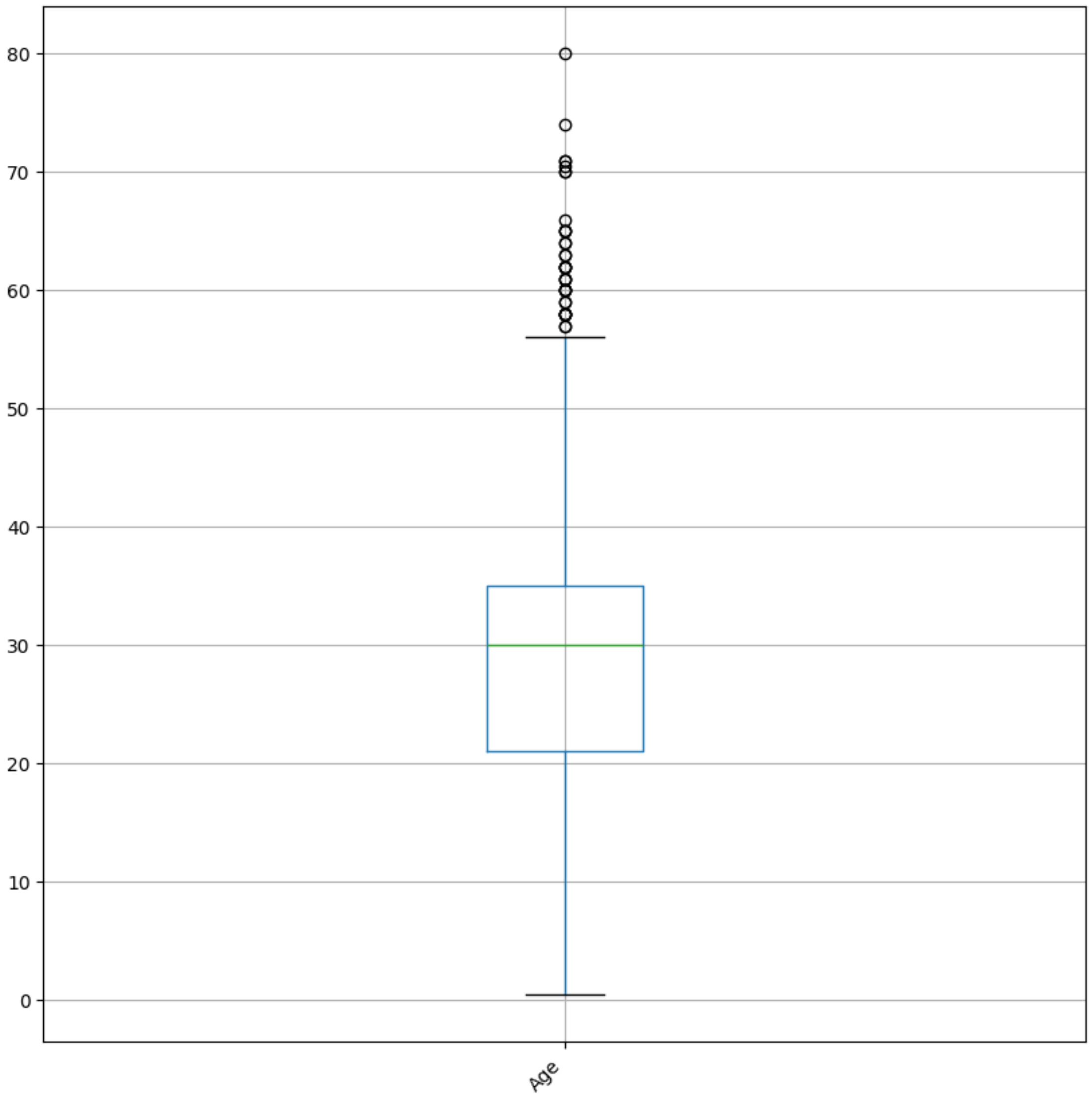


[111]:
```
# Estimar parámetros de la distribución normal
mu, sigma = np.mean(df_numeric['Fare']), np.std(df_numeric['Fare'])

# Crear el rango de valores para la curva
x = np.linspace(min(df_numeric['Fare']), max(df_numeric['Fare']), 100)

y = stats.norm.pdf(x, mu, sigma)

# Graficar el histograma y la curva de densidad
plt.hist(df_numeric['Fare'], bins=30, density=True, alpha=0.6, color='b',␣
 ↪label='Histograma de datos')
plt.plot(x, y, 'r', label=f'Distribución Normal ($\mu={mu:.2f}$, $\sigma={sigma:
 ↪.2f}$)')
plt.xlabel('Valores')
plt.ylabel('Densidad de Probabilidad')
plt.title('Aproximación a la Distribución Normal en Tarifa')
plt.legend()
plt.show()
```



[112]:

```
# Boxplot of first 10 numeric columns
boxplot_df = numeric_df[['Age']]
fig, ax = plt.subplots(nrows=1, ncols=1, figsize=(10, 10))
boxplot_df.boxplot(ax=ax)
ax.set_xticklabels(ax.get_xticklabels(),rotation = 45,horizontalalignment␣
 ↪='right',)
ax.tick_params(labelsize = 10)
```


80
70
60
50
40
30
20
10
0
Age

```
[ ]:
```