In [76]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [77]:
```
# %matplotlib inline
```

In [78]:
```
data = pd.read_csv("movie_metadata_cleaned.csv")
```

In [79]:
```
data.head(2)
```

Out[79]:

	Unnamed: 0	movie_title	color	director_name	num_critic_for_reviews	duration	director_facebook_likes	actor_3_facebook_likes
0	0	b'Avatar'	Color	James Cameron	723.0	178.0	0.0	855.0
1	1	b"Pirates of the Caribbean: At World's End"	Color	Gore Verbinski	302.0	169.0	563.0	1000.0

2 rows × 29 columns

Get the top 10 directors with most movies directed and use a boxplot for their gross earnings

In [81]:
```
df=pd.DataFrame(data)
```

In [82]:
```
director_counts = df['director_name'].value_counts().head(10).index
```

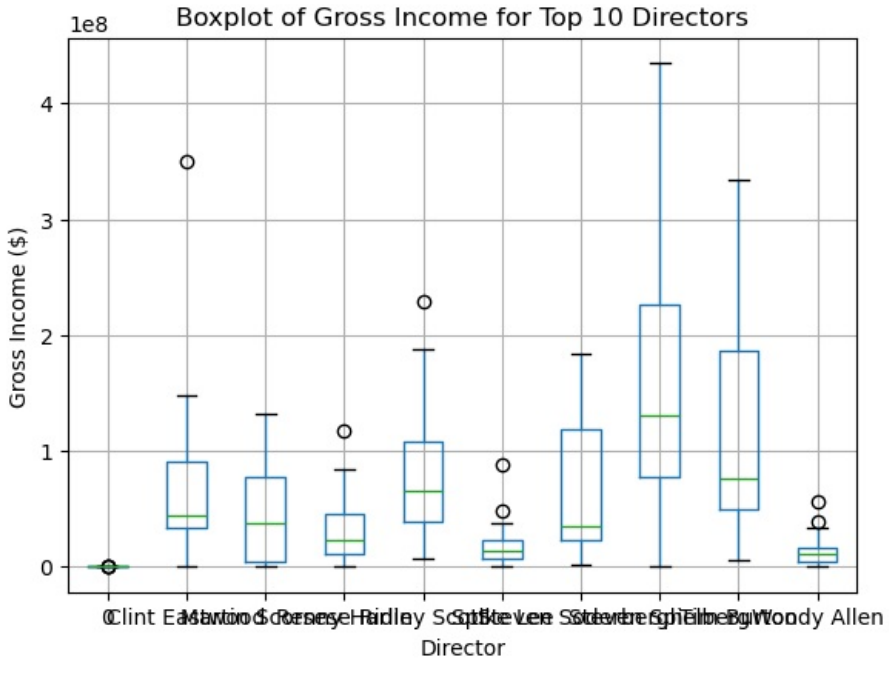
In [83]:
```
print(director_counts)
```

```
Index(['0', 'Steven Spielberg', 'Woody Allen', 'Martin Scorsese',
       'Clint Eastwood', 'Ridley Scott', 'Tim Burton', 'Steven Soderbergh',
       'Spike Lee', 'Renny Harlin'],
      dtype='object', name='director_name')
```

In [84]:
```
filtered_df = df[df['director_name'].isin(director_counts)]
```

In [85]:
```
plt.figure(figsize=(10, 6))
filtered_df.boxplot(column='gross', by='director_name', )
plt.title('Boxplot of Gross Income for Top 10 Directors')
plt.suptitle('')
plt.xlabel('Director')
plt.ylabel('Gross Income ($)')
plt.show()
```

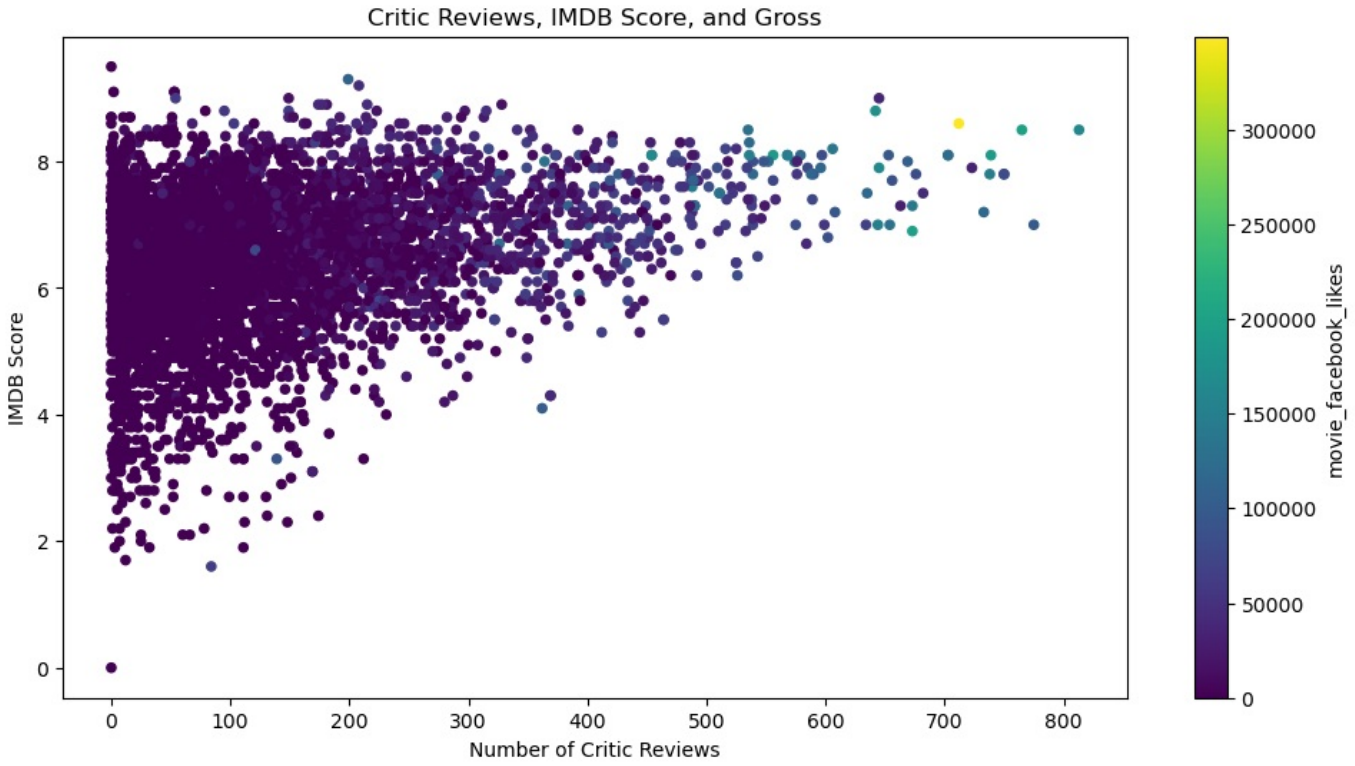
```
<Figure size 1000x600 with 0 Axes>
```



Plot the following variables in one graph:

- num_critic_for_reviews
- IMDB score
- gross

In [87]:
```
fig, ax = plt.subplots(figsize=(12, 6))
data.plot(kind='scatter', x='num_critic_for_reviews', y='imdb_score', c='movie_facebook_likes', ax=ax, colormap=
ax.set_title('Critic Reviews, IMDB Score, and Gross')
ax.set_xlabel('Number of Critic Reviews')
ax.set_ylabel('IMDB Score')
plt.show()
```



Compute Sales (Gross - Budget), add it as another column

In [89]:
```
data['sales'] = data['gross'] - data['budget']
```

In [90]:
```
sales=data['sales']
```

In [91]:
```
print(sales)
```

```
0       523505847.0
1         9404152.0
2       -44925825.0
3       198130642.0
4               0.0
           ...
5039            0.0
5040        -1400.0
5041        10443.0
5042        84122.0
5043            0.0
Name: sales, Length: 5044, dtype: float64
```

Which directors garnered the most total sales?

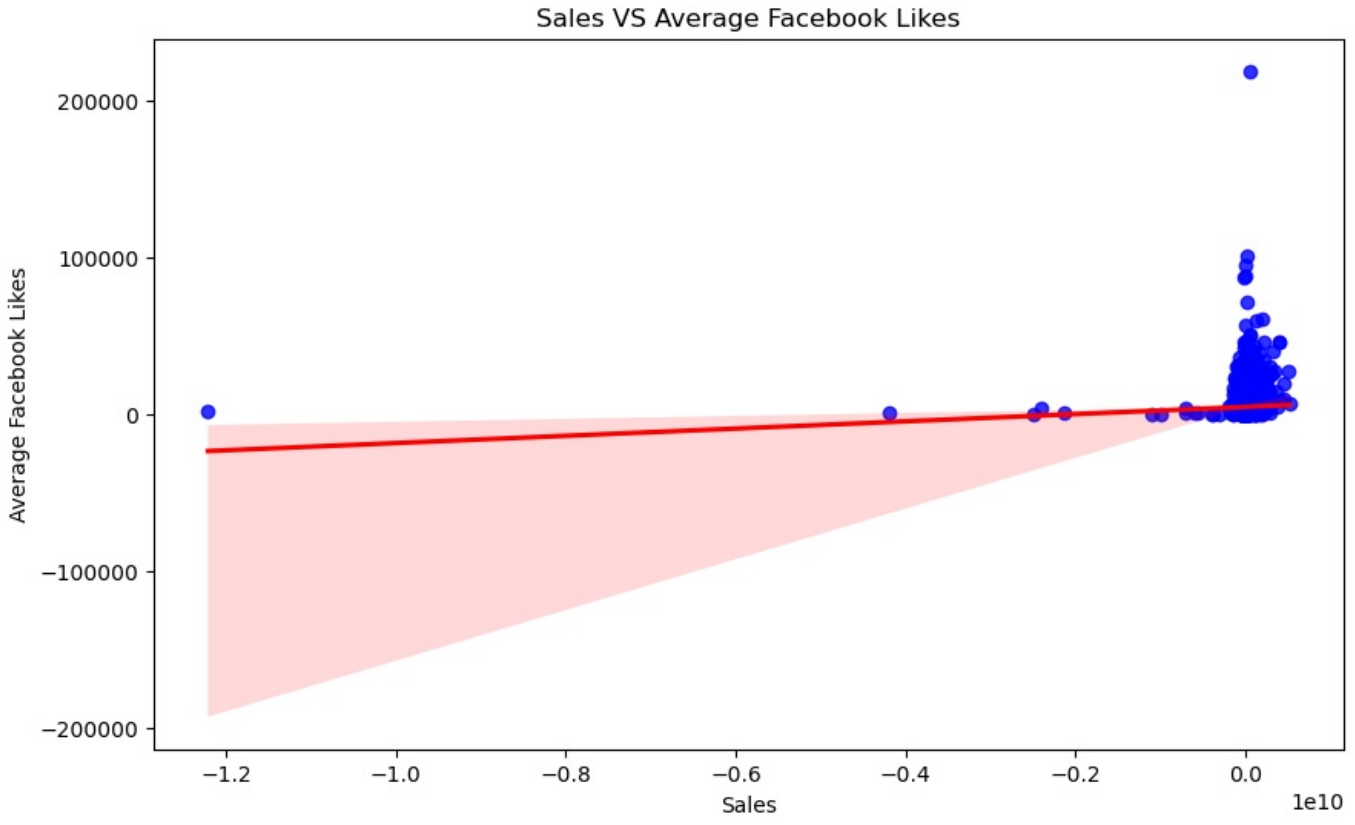
In [93]:
```
director_sales = data.groupby('director_name')['sales'].sum().sort_values(ascending=False)
print(director_sales.head(10))
```

```
director_name
Steven Spielberg     2.451332e+09
George Lucas         1.386641e+09
James Cameron        1.199626e+09
Joss Whedon          1.000887e+09
Chris Columbus       9.417076e+08
Peter Jackson        9.009693e+08
Tim Burton           8.242755e+08
Christopher Nolan    8.082276e+08
Jon Favreau          7.693815e+08
Francis Lawrence     7.555020e+08
Name: sales, dtype: float64
```

Plot sales and average likes as a scatterplot. Fit it with a line.

In [117…

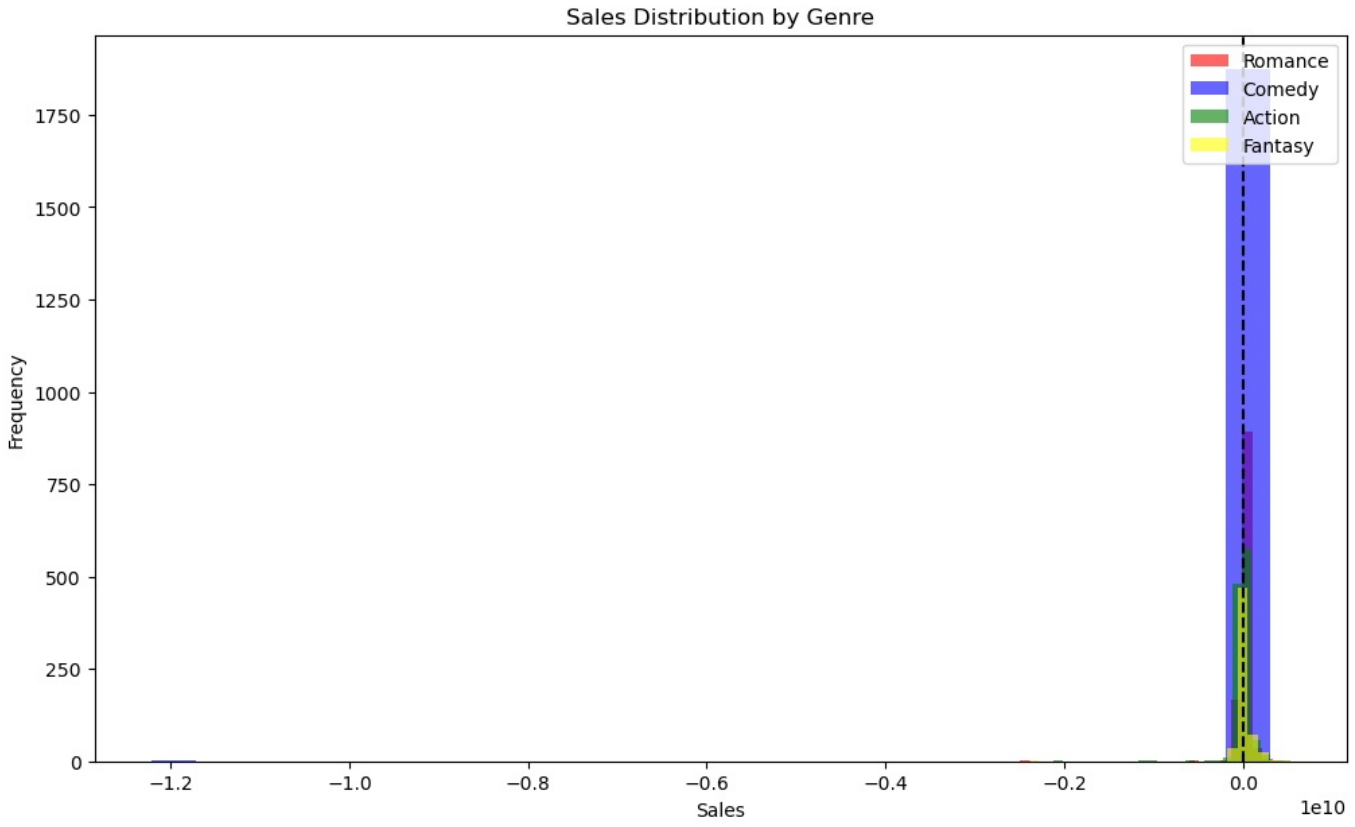
```python
# Calculate the average of Facebook Likes
data['average_facebook_likes'] = data[
    [
        'director_facebook_likes',
        'actor_1_facebook_likes',
        'actor_2_facebook_likes',
        'actor_3_facebook_likes',
        'cast_total_facebook_likes',
        'movie_facebook_likes'
    ]
].mean(axis=1)

# Plot the scatterplot with regression line
plt.figure(figsize=(10, 6))
sns.regplot(
    x=data['sales'],
    y=data['average_facebook_likes'],
    scatter_kws={'color': 'blue'},
    line_kws={'color': 'red'}
)

# Labels and title
plt.xlabel('Sales')
plt.ylabel('Average Facebook Likes')
plt.title('Sales VS Average Facebook Likes')

# Show plot
plt.show()
```



Which of these genres are the most profitable? Plot their sales using different histograms, superimposed in the same axis.

- Romance
- Comedy
- Action
- Fantasy

In [130…
```
import matplotlib.pyplot as plt

# Define genres and calculate sales for each genre
genres = ['Romance', 'Comedy', 'Action', 'Fantasy']
genre_sales = {genre: data[data['genres'].str.contains(genre, case=False, na=False)]['sales'] for genre in genr

# Plot histograms
plt.figure(figsize=(12, 7))

colors = ['red', 'blue', 'green', 'yellow']
for genre, color in zip(genres, colors):
    plt.hist(genre_sales[genre], bins=25, alpha=0.6, label=genre, color=color)

# Labels and title
plt.xlabel('Sales')
plt.ylabel('Frequency')
plt.title('Sales Distribution by Genre')
plt.legend(loc='upper right')


# Add a vertical line at 0
plt.axvline(x=0, color='black', linestyle='--', linewidth=1.5)


plt.show()
```



For each of movie, compute average likes of the three actors and store it as a new variable

Read up on the mean function.

Store it a new column, average_actor_likes.

In [139…
```
data['average_actor_likes'] = (data['actor_1_facebook_likes'] + data['actor_2_facebook_likes'] + data['actor_3_
print(data['average_actor_likes'])
```

```
0         930.333333
1       15333.333333
2        3851.333333
3       24333.333333
4          47.666667
             ...
5039      584.333333
5040        0.000000
5041      718.000000
5042       41.666667
5043        0.000000
Name: average_actor_likes, Length: 5044, dtype: float64
```

Copying the whole dataframe

In [142…
```
df = data.copy()
df.head()
```

Out[142…

	Unnamed: 0	movie_title	color	director_name	num_critic_for_reviews	duration	director_facebook_likes	actor_3_facebook_likes
0	0	b'Avatar'	Color	James Cameron	723.0	178.0	0.0	855.0
1	1	b"Pirates of the Caribbean: At World's End"	Color	Gore Verbinski	302.0	169.0	563.0	1000.0
2	2	b'Spectre'	Color	Sam Mendes	602.0	148.0	0.0	161.0
3	3	b'The Dark Knight Rises'	Color	Christopher Nolan	813.0	164.0	22000.0	23000.0
4	4	b'Star Wars: Episode VII - The Force Awakens ...	0	Doug Walker	0.0	0.0	131.0	0.0

5 rows × 32 columns

In [158…
```
numeric_cols = data.select_dtypes(include=['integer', 'float']).columns
# Normalize all numeric columns in the DataFrame
normalized = (data[numeric_cols] - data[numeric_cols].min()) / (data[numeric_cols].max() - data[numeric_cols].m
print(normalized)
```

	Unnamed: 0	num_critic_for_reviews	duration	director_facebook_likes	\
0	0.000000	0.889299	0.941799	0.000000	
1	0.000198	0.371464	0.894180	0.024478	
2	0.000397	0.740467	0.783069	0.000000	
3	0.000595	1.000000	0.867725	0.956522	
4	0.000793	0.000000	0.000000	0.005696	
...	...	...	...	...	
5039	0.999207	0.052891	0.227513	0.000000	
5040	0.999405	0.015990	0.402116	0.000000	
5041	0.999603	0.017220	0.529101	0.000000	
5042	0.999802	0.052891	0.476190	0.000696	
5043	1.000000	0.000000	0.000000	0.000000	

	actor_3_facebook_likes	actor_1_facebook_likes	gross	\
0	0.037174	0.001563	1.000000	
1	0.043478	0.062500	0.406840	
2	0.007000	0.017188	0.263080	
3	1.000000	0.042188	0.589253	
4	0.000000	0.000205	0.000000	
...	...	...	...	
5039	0.013870	0.001314	0.000000	
5040	0.000000	0.000000	0.000000	
5041	0.021261	0.001478	0.000014	
5042	0.000696	0.000134	0.000112	
5043	0.000000	0.000000	0.000000	

	num_voted_users	cast_total_facebook_likes	facenumber_in_poster	\
0	0.524454	0.007361	0.000000	
1	0.278867	0.073622	0.000000	
2	0.163258	0.017816	0.023256	
3	0.677217	0.162561	0.000000	
4	0.000005	0.000218	0.000000	
...	...	...	...	
5039	0.043698	0.002669	0.023256	
5040	0.000022	0.000000	0.000000	
5041	0.000743	0.003633	0.116279	
5042	0.002536	0.000248	0.000000	
5043	0.000000	0.000000	0.000000	

	num_user_for_reviews	budget	title_year	actor_2_facebook_likes	\
0	0.603557	1.940158e-02	0.996528	0.006832	
1	0.244664	2.455896e-02	0.995536	0.036496	
2	0.196443	2.005649e-02	0.999504	0.002869	
3	0.533794	2.046580e-02	0.998016	0.167883	
4	0.000000	0.000000e+00	0.000000	0.000088	
...	...	...	...	...	
5039	0.070949	0.000000e+00	0.000000	0.004328	
5040	0.000593	1.146085e-07	0.998512	0.000000	
5041	0.001779	0.000000e+00	0.998016	0.005248	
5042	0.016601	9.004953e-08	0.994048	0.000168	
5043	0.000000	0.000000e+00	0.999008	0.000000	

	imdb_score	aspect_ratio	movie_facebook_likes	sales	\
0	0.831579	0.111250	0.094556	1.000000	
1	0.747368	0.146875	0.000000	0.959637	
2	0.715789	0.146875	0.243553	0.955371	
3	0.894737	0.146875	0.469914	0.974454	
4	0.747368	0.000000	0.000000	0.958898	
...	...	...	...	...	
5039	0.789474	1.000000	0.091691	0.958898	
5040	0.663158	0.000000	0.000046	0.958898	
5041	0.663158	0.146875	0.001891	0.958899	
5042	0.694737	0.115625	0.001307	0.958905	
5043	0.000000	0.000000	0.000000	0.958898	

	average_facebook_likes	average_actor_likes
0	0.030964	0.004261
1	0.072341	0.070229
2	0.082510	0.017640
3	0.278777	0.111450
4	0.000318	0.000218
...	...	...
5039	0.027062	0.002676
5040	0.000012	0.000000
5041	0.003963	0.003289
5042	0.000579	0.000191
5043	0.000000	0.000000

[5044 rows x 20 columns]

In [ ]: