In [1]:

```
# Assignment - A5  |  Name : Pratik Pingale  |  Roll No : 19CO056
```

In [2]:

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns

df = pd.read_csv('Social_Network_Ads.csv')
df.head()
```

Out[2]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19.0	19000.0	0
1	15810944	Male	35.0	20000.0	0
2	15668575	Female	26.0	43000.0	0
3	15603246	Female	27.0	57000.0	0
4	15804002	Male	19.0	76000.0	0

In [3]:

```
X = df[['Age', 'EstimatedSalary']]
Y = df['Purchased']
```

In [4]:

```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler

X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.25, random
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)

print(f'Train Dataset Size - X: {X_train.shape}, Y: {Y_train.shape}')
print(f'Test  Dataset Size - X: {X_test.shape}, Y: {Y_test.shape}')
```

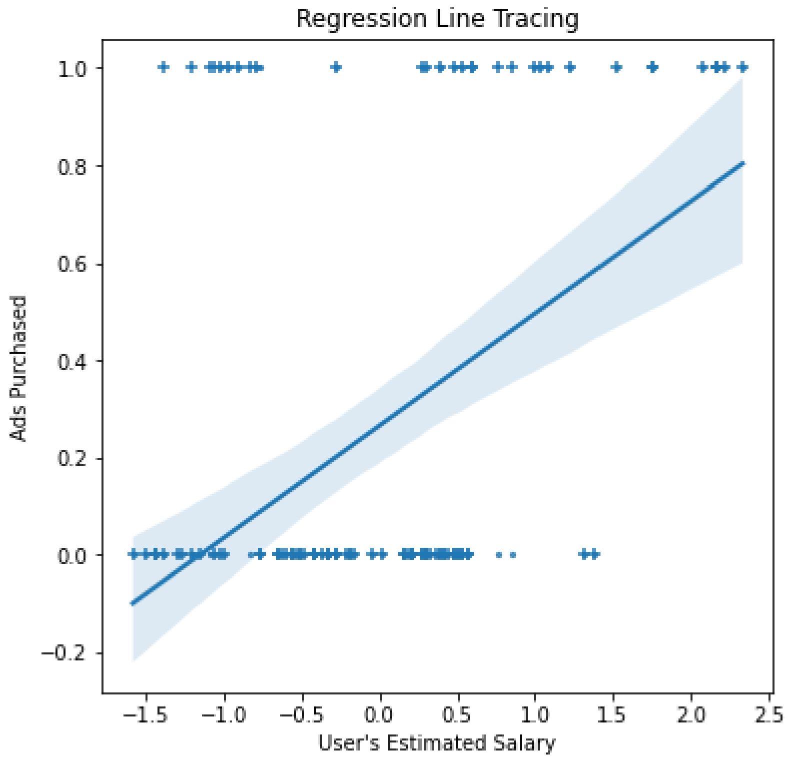
```
Train Dataset Size - X: (300, 2), Y: (300,)
Test  Dataset Size - X: (100, 2), Y: (100,)
```

In [5]:

```
from sklearn.linear_model import LogisticRegression

lm = LogisticRegression(random_state = 0, solver='lbfgs' )
lm.fit(X_train, Y_train)
predictions = lm.predict(X_test)

plt.figure(figsize=(6, 6))
sns.regplot(x = X_test[:, 1], y = predictions, scatter_kws={'s':5})
plt.scatter(X_test[:, 1], Y_test, marker = '+')
plt.xlabel("User's Estimated Salary")
plt.ylabel('Ads Purchased')
plt.title('Regression Line Tracing')
```

Out[5]:

```
Text(0.5, 1.0, 'Regression Line Tracing')
```



Confusion matrix

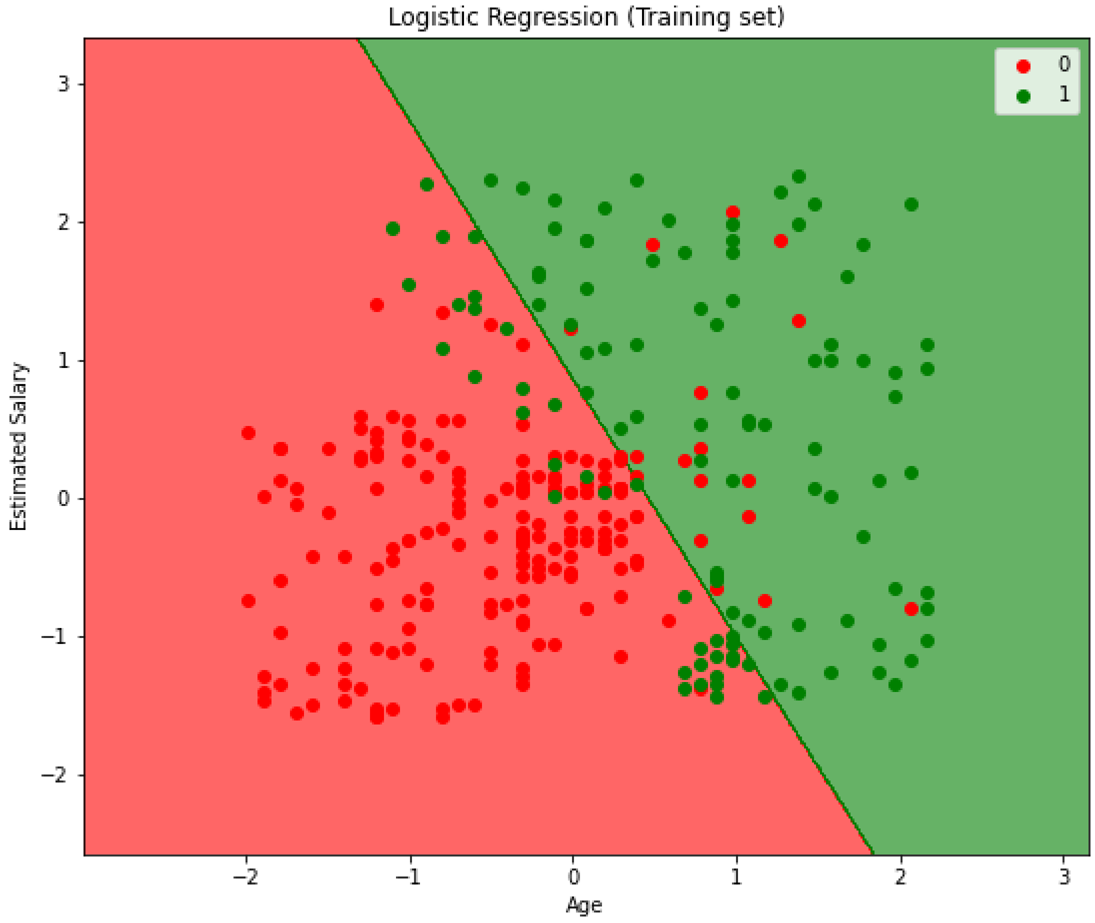
In [6]:

```
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report

cm = confusion_matrix(Y_test, predictions)
print(f'''Confusion matrix :\n
               | Positive Prediction\t| Negative Prediction
---------------+------------------------+----------------------
Positive Class | True Positive (TP) {cm[0, 0]}\t| False Negative (FN) {cm[0, 1]}
---------------+------------------------+----------------------
Negative Class | False Positive (FP) {cm[1, 0]}\t| True Negative (TN) {cm[1, 1]}\n

cr = classification_report(Y_test, predictions)
print('Classification report : \n', cr)
```

```
Confusion matrix :

               | Positive Prediction    | Negative Prediction
---------------+------------------------+----------------------
Positive Class | True Positive (TP) 65  | False Negative (FN) 3
---------------+------------------------+----------------------
Negative Class | False Positive (FP) 8  | True Negative (TN) 24


Classification report :
               precision    recall  f1-score   support

           0       0.89      0.96      0.92        68
           1       0.89      0.75      0.81        32

    accuracy                           0.89       100
   macro avg       0.89      0.85      0.87       100
weighted avg       0.89      0.89      0.89       100
```

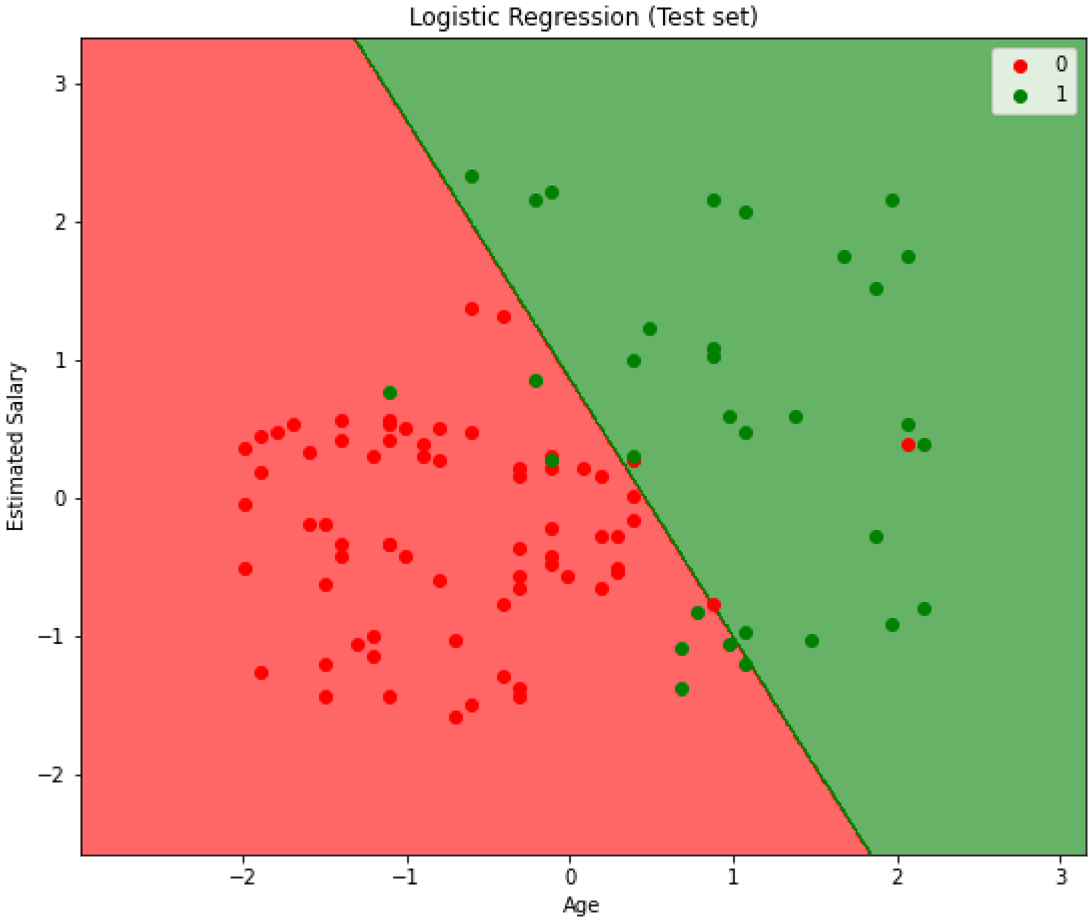
In [7]:

```
# Visualizing the Training set results
from matplotlib.colors import ListedColormap
X_set, y_set = X_train, Y_train
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].m
                     np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].m

plt.figure(figsize=(9, 7.5))
plt.contourf(X1, X2, lm.predict(np.array([X1.ravel(), X2.ravel()]).T).reshape(X1.s
             alpha = 0.6, cmap = ListedColormap(('red', 'green')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                color = ListedColormap(('red', 'green'))(i), label = j)
plt.title('Logistic Regression (Training set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```



In [8]:

```
# Visualizing the Test set results
from matplotlib.colors import ListedColormap
X_set, y_set = X_test, Y_test
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].m
                     np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].m

plt.figure(figsize=(9, 7.5))
plt.contourf(X1, X2, lm.predict(np.array([X1.ravel(), X2.ravel()]).T).reshape(X1.s
             alpha = 0.6, cmap = ListedColormap(('red', 'green')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                color = ListedColormap(('red', 'green'))(i), label = j)
plt.title('Logistic Regression (Test set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```


Logistic Regression (Test set)
Estimated Salary
Age