In [1]:

```
#Importing all Libraries

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
import pickle
```

In [2]:

```
# Load the dataset
dataset = pd.read_csv(r"C:\Users\Jan Saida\OneDrive\Documents\Salary_Data.csv")
```

In [3]:

```
dataset
```

Out[3]:

	YearsExperience	Salary
0	1.1	39343
1	1.3	46205
2	1.5	37731
3	2.0	43525
4	2.2	39891
5	2.9	56642
6	3.0	60150
7	3.2	54445
8	3.2	64445
9	3.7	57189
10	3.9	63218
11	4.0	55794
12	4.0	56957
13	4.1	57081
14	4.5	61111
15	4.9	67938
16	5.1	66029
17	5.3	83088
18	5.9	81363
19	6.0	93940
20	6.8	91738
21	7.1	98273
22	7.9	101302
23	8.2	113812
24	8.7	109431
25	9.0	105582
26	9.5	116969
27	9.6	112635
28	10.3	122391
29	10.5	121872

In [4]:

```
# Split the data into independent and dependent variables
X = dataset.iloc[:, :-1].values
y = dataset.iloc[:, 1].values
```

In [5]:

```
X
```

```
Out[5]:  array([[ 1.1],
                [ 1.3],
                [ 1.5],
                [ 2. ],
                [ 2.2],
                [ 2.9],
                [ 3. ],
                [ 3.2],
                [ 3.2],
                [ 3.7],
                [ 3.9],
                [ 4. ],
                [ 4. ],
                [ 4.1],
                [ 4.5],
                [ 4.9],
                [ 5.1],
                [ 5.3],
                [ 5.9],
                [ 6. ],
                [ 6.8],
                [ 7.1],
                [ 7.9],
                [ 8.2],
                [ 8.7],
                [ 9. ],
                [ 9.5],
                [ 9.6],
                [10.3],
                [10.5]])
```

```
In [6]: y
```

```
Out[6]:  array([ 39343,  46205,  37731,  43525,  39891,  56642,  60150,  54445,
                 64445,  57189,  63218,  55794,  56957,  57081,  61111,  67938,
                 66029,  83088,  81363,  93940,  91738,  98273, 101302, 113812,
                109431, 105582, 116969, 112635, 122391, 121872], dtype=int64)
```

```
In [7]: # Split the dataset into training and testing sets (80-20%)
        X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20, random_state=0)
```

```
In [8]: X_train
```

```
Out[8]:  array([[ 9.6],
                [ 4. ],
                [ 5.3],
                [ 7.9],
                [ 2.9],
                [ 5.1],
                [ 3.2],
                [ 4.5],
                [ 8.2],
                [ 6.8],
                [ 1.3],
                [10.5],
                [ 3. ],
                [ 2.2],
                [ 5.9],
                [ 6. ],
                [ 3.7],
                [ 3.2],
                [ 9. ],
                [ 2. ],
                [ 1.1],
                [ 7.1],
                [ 4.9],
                [ 4. ]])
```

```
In [9]: X_test
```

```
Out[9]:  array([[ 1.5],
                [10.3],
                [ 4.1],
                [ 3.9],
                [ 9.5],
                [ 8.7]])
```

```
In [10]: y_train
```

```
Out[10]: array([112635,  55794,  83088, 101302,  56642,  66029,  64445,  61111,
                113812,  91738,  46205, 121872,  60150,  39891,  81363,  93940,
                 57189,  54445, 105582,  43525,  39343,  98273,  67938,  56957],
               dtype=int64)
```

In [11]:

```
y_test
```

Out[11]:

```
array([ 37731, 122391,  57081,  63218, 116969, 109431], dtype=int64)
```

In [12]:

```
# Train the model
regressor = LinearRegression()
regressor.fit(X_train, y_train)
```

Out[12]:

```
▾ LinearRegression ⓘ ?
LinearRegression()
```

In [13]:

```
# Predict the test set
y_pred = regressor.predict(X_test)
```

In [14]:

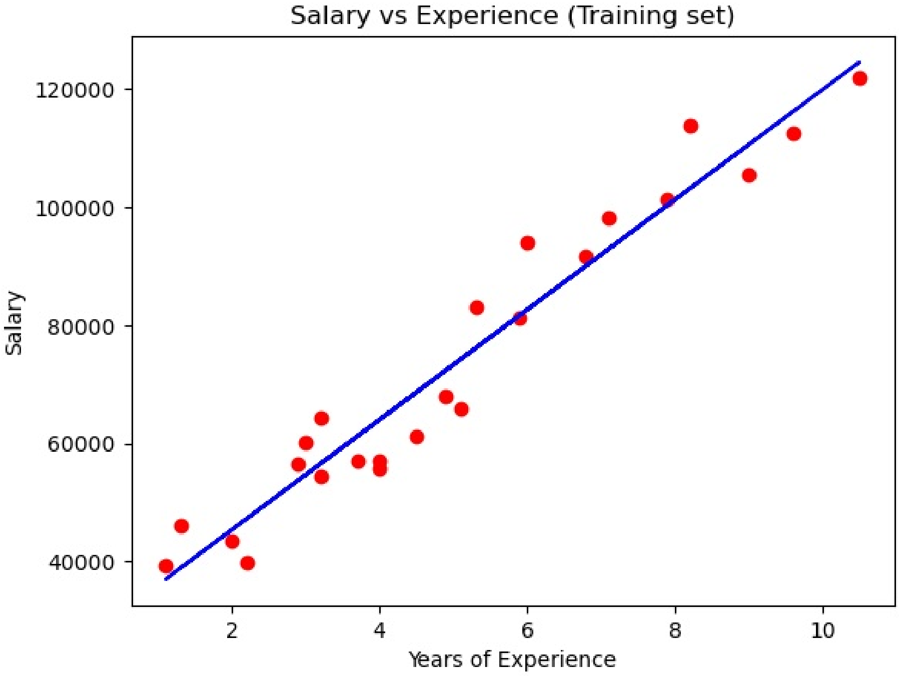
```
y_pred
```

Out[14]:

```
array([ 40748.96184072, 122699.62295594,  64961.65717022,  63099.14214487,
       115249.56285456, 107799.50275317])
```

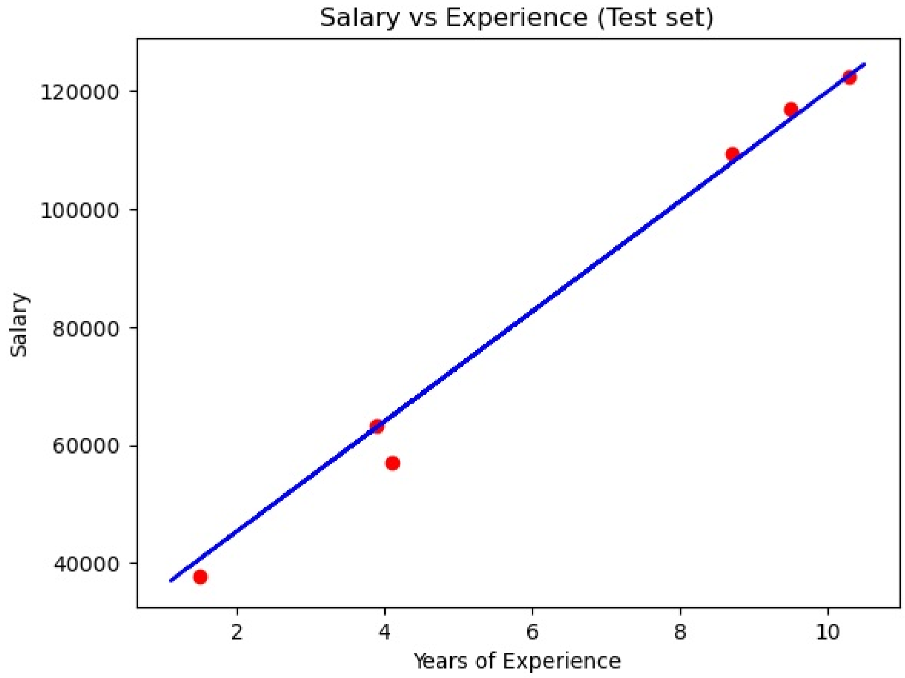
In [15]:

```
# Visualize the training set
plt.scatter(X_train, y_train, color='red')
plt.plot(X_train, regressor.predict(X_train), color='blue')
plt.title('Salary vs Experience (Training set)')
plt.xlabel('Years of Experience')
plt.ylabel('Salary')
plt.show()
```



In [16]:

```
# Visualize the test set
plt.scatter(X_test, y_test, color='red')
plt.plot(X_train, regressor.predict(X_train), color='blue')
plt.title('Salary vs Experience (Test set)')
plt.xlabel('Years of Experience')
plt.ylabel('Salary')
plt.show()
```



In [17]:

```
# Predict salary for 12 and 20 years of experience using the trained model
y_12 = regressor.predict([[12]])
y_20 = regressor.predict([[20]])
print(f"Predicted salary for 12 years of experience: ${y_12[0]:,.2f}")
print(f"Predicted salary for 20 years of experience: ${y_20[0]:,.2f}")
```

```
Predicted salary for 12 years of experience: $138,531.00
Predicted salary for 20 years of experience: $213,031.60
```

In [18]:

```
# Check model performance
bias = regressor.score(X_train, y_train)
variance = regressor.score(X_test, y_test)
train_mse = mean_squared_error(y_train, regressor.predict(X_train))
test_mse = mean_squared_error(y_test, y_pred)
```

In [19]:

```
bias
```

Out[19]:

```
0.9411949620562126
```

In [20]:

```
variance
```

Out[20]:

```
0.988169515729126
```

In [21]:

```
train_mse
```

Out[21]:

```
36149670.11816131
```

In [22]:

```
test_mse
```

Out[22]:

```
12823412.298126549
```

In [23]:

```
print(f"Training Score (R^2): {bias:.2f}")
print(f"Testing Score (R^2): {variance:.2f}")
print(f"Training MSE: {train_mse:.2f}")
print(f"Test MSE: {test_mse:.2f}")
```

```
Training Score (R^2): 0.94
Testing Score (R^2): 0.99
Training MSE: 36149670.12
Test MSE: 12823412.30
```

In [24]:

```
# Save the trained model to disk
filename = 'linear_regression_model.pkl'
with open(filename, 'wb') as file:
    pickle.dump(regressor, file)
print("Model has been pickled and saved as linear_regression_model.pkl")
```

```
Model has been pickled and saved as linear_regression_model.pkl
```

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