Analysis - Why linear regression is not suitable for classification.

Plotted Age vs Purchasing Power.

From the Mean Square Errors and Linear/Logistic Graph Plots.

Label/Class '0' indicates, Person is not able to purchase.

Label/Class '1' indicates, Person is able to purchase.

Linear regression mean square error is very high compared to Logistic regression.

Linear regression R2: 0.42112651342340734 Logistic regression R2: 0.9553066567250714 Linear regression RMSE: 0.12863855257257611 Logistic regression RMSE: 0.009931854061095247

In [58]:

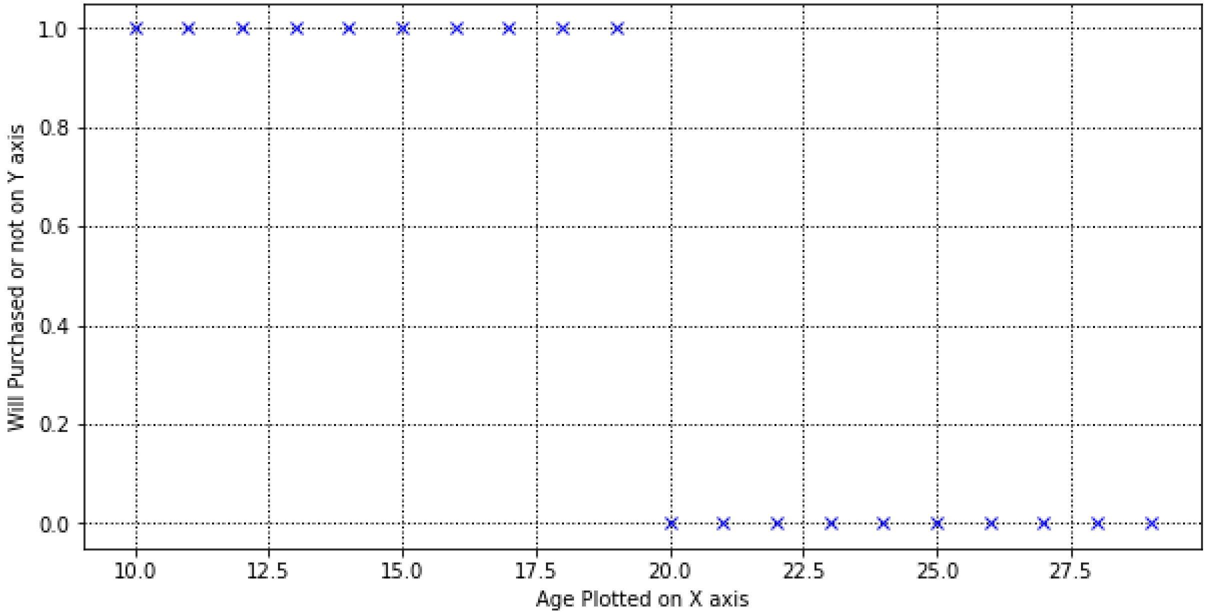
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

from sklearn.linear_model import LinearRegression
lin_regression = LinearRegression()

from sklearn.linear_model import LogisticRegression
log_regression = LogisticRegression(solver='lbfgs')

from sklearn.metrics import mean_squared_error, r2_score
```

In [59]:

```
x = np.array([i for i in range(10,30)])
y = np.concatenate([np.ones(10), np.zeros(10)])
```

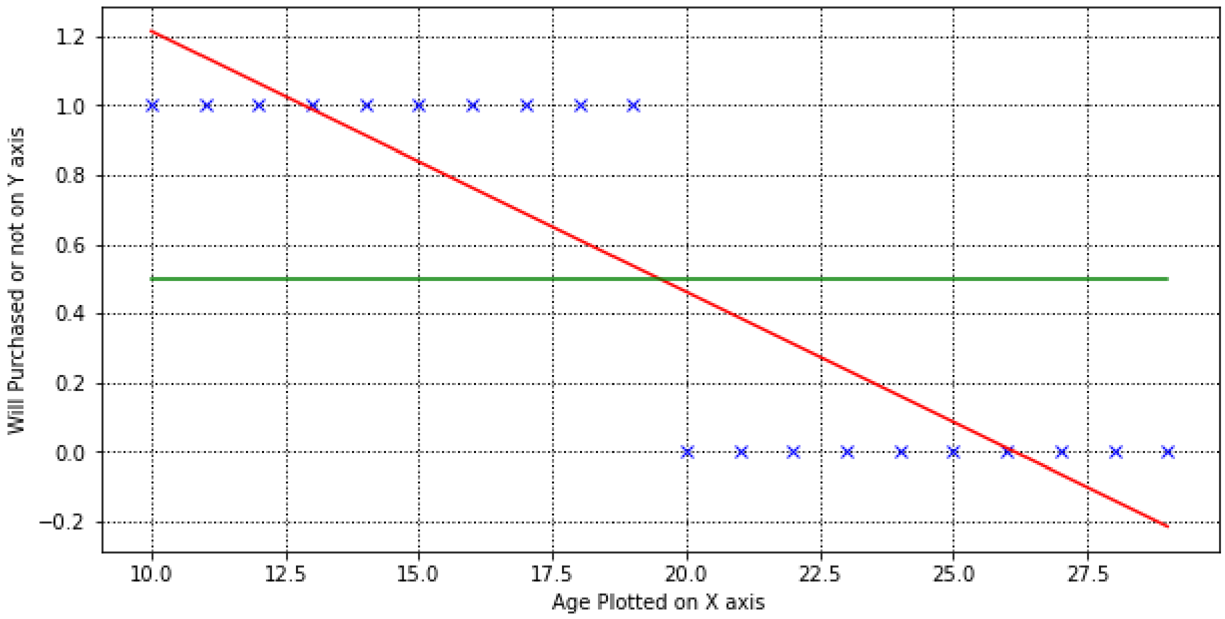
In [60]:

```
fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
_ = plt.plot(x, y, 'xb')
```



In [61]:

```
_ = lin_regression.fit(pd.DataFrame(x), y)

lin_y_pred_1 = lin_regression.predict(pd.DataFrame(x))

line_point_5 = x * 0 + .5

fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
plt.plot(x, y, 'xb')
plt.plot(x, lin_y_pred_1, '-r')
_ = plt.plot(x, line_point_5,'-g')
```



In [62]:

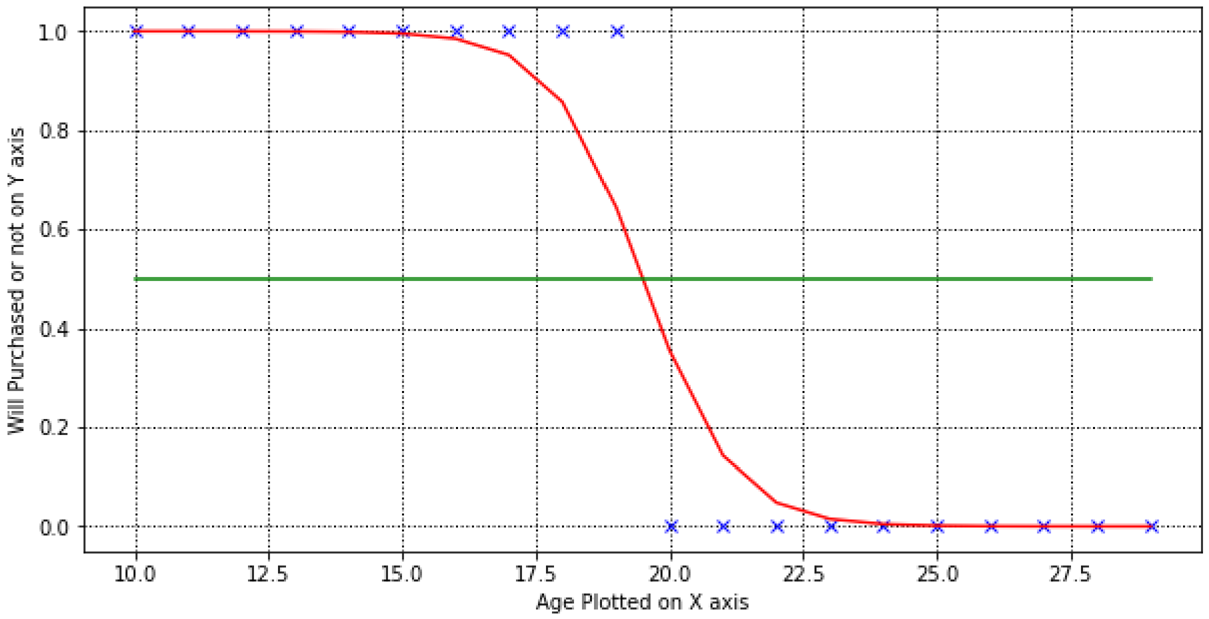
```
test_x = np.array([i for i in range(10,35,5)])
test_y_pred = lin_regression.predict(pd.DataFrame(test_x))
test_y_pred
```

Out[62]:

```
array([ 1.21428571,  0.83834586,  0.46240602,  0.08646617, -0.28947368])
```

In [63]:

```
_ = log_regression.fit(pd.DataFrame(x), y)

y_pred = log_regression.predict_proba(pd.DataFrame(x))
log_y_pred_1 = [item[1] for item in y_pred]

fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
plt.plot(x, y, 'xb')
plt.plot(x, log_y_pred_1, '-r')
_ = plt.plot(x, line_point_5,'-g')
```



In [64]:

```
print("Linear regression R2: ", r2_score(y, lin_y_pred_1))
print("Logistic regression R2: ", r2_score(y, log_y_pred_1))
print("Linear regression RMSE: ", mean_squared_error(y, lin_y_pred_1))
print("Logistic regression RMSE: ", mean_squared_error(y, log_y_pred_1))
```

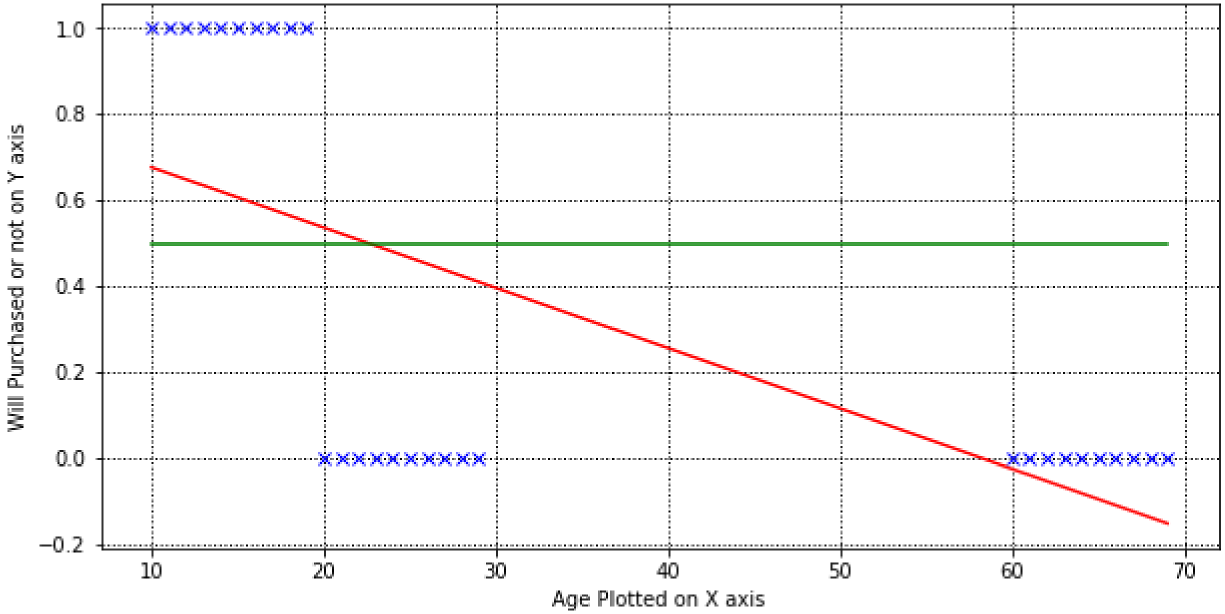
```
Linear regression R2:  0.7518796992481204
Logistic regression R2:  0.9404089597242656
Linear regression RMSE:  0.062030075187969914
Logistic regression RMSE:  0.014897760068933594
```

In [65]:

```
x = np.append(x, np.array([i for i in range(60,70)]))
y = np.append(y, np.zeros(10))
```

In [66]:

```
_ = lin_regression.fit(pd.DataFrame(x), y)

lin_y_pred_2 = lin_regression.predict(pd.DataFrame(x))

line_point_5 = x * 0 + .5

fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
plt.plot(x, y, 'xb')
plt.plot(x, lin_y_pred_2, '-r')
_ = plt.plot(x, line_point_5,'-g')
```



In [67]:

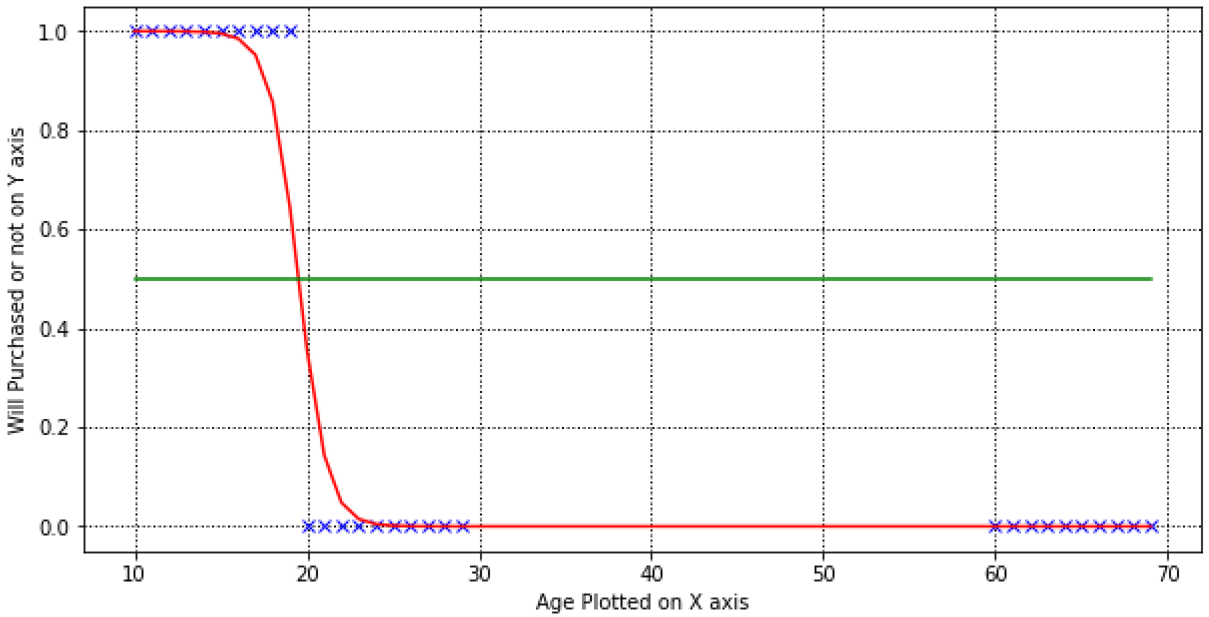
```
test_x = np.array([i for i in range(18,26)])
test_y_pred = lin_regression.predict(pd.DataFrame(test_x))
test_y_pred
```

Out[67]:

```
array([0.56495292, 0.55091537, 0.53687781, 0.52284026, 0.50880271,
       0.49476516, 0.48072761, 0.46669006])
```

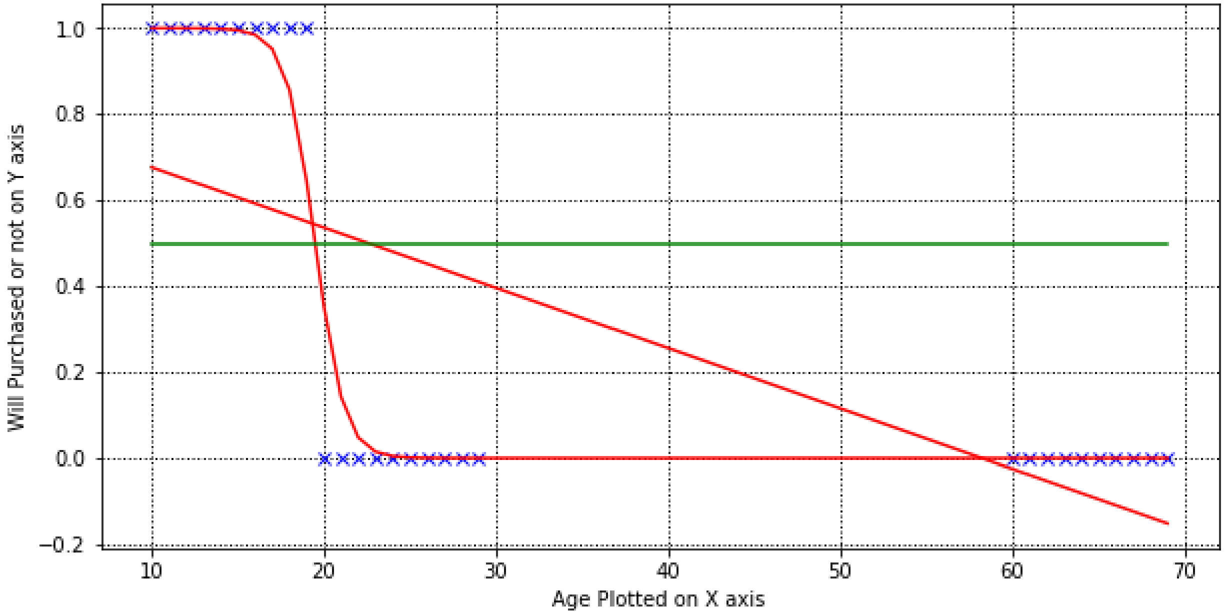
In [68]:

```
_ = log_regression.fit(pd.DataFrame(x), y)

y_pred = log_regression.predict_proba(pd.DataFrame(x))
log_y_pred_2 = [item[1] for item in y_pred]

fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
plt.plot(x, y, 'xb')
plt.plot(x, log_y_pred_2, '-r')
_ = plt.plot(x, line_point_5,'-g')
```



In [69]:

```
fig = plt.figure(figsize=(10,5))
xlabel = 'Age Plotted on X axis'
ylabel = 'Will Purchased or not on Y axis'
plt.xlabel(xlabel)
plt.ylabel(ylabel)
plt.grid(color='k', linestyle=':', linewidth=1)
plt.plot(x, y, 'xb')
plt.plot(x, lin_y_pred_2, '-r')
plt.plot(x, log_y_pred_2, '-r')
_ = plt.plot(x, line_point_5,'-g')
```



```
In [70]: test_y_pred = log_regression.predict_proba(pd.DataFrame(test_x))
         test_y_pred
```

```
Out[70]: array([[0.14286332, 0.85713668],
                [0.35497559, 0.64502441],
                [0.64502249, 0.35497751],
                [0.85713565, 0.14286435],
                [0.95194543, 0.04805457],
                [0.98494151, 0.01505849],
                [0.99539093, 0.00460907],
                [0.99859958, 0.00140042]])
```

```
In [71]: print("Linear regression R2: ", r2_score(y, lin_y_pred_2))
         print("Logistic regression R2: ", r2_score(y, log_y_pred_2))
         print("Linear regression RMSE: ", mean_squared_error(y, lin_y_pred_2))
         print("Logistic regression RMSE: ", mean_squared_error(y, log_y_pred_2))
```

```
Linear regression R2:  0.42112651342340734
Logistic regression R2:  0.9553066567250714
Linear regression RMSE:  0.12863855257257611
Logistic regression RMSE:  0.009931854061095247
```

```
In [ ]:
```

```
In [ ]:
```