In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
df=pd.read_csv(r"C:\Users\91903\Downloads\loan1.csv")
df
```

Out[2]:

	Home Owner	Marital Status	Annual Income	Defaulted Borrower
0	Yes	Single	125	No
1	No	Married	100	No
2	No	Single	70	No
3	Yes	Married	120	No
4	No	Divorced	95	Yes
5	No	Married	60	No
6	Yes	Divorced	220	No
7	No	Single	85	Yes
8	No	Married	75	No
9	No	Single	90	Yes

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   Home Owner          10 non-null     object
 1   Marital Status      10 non-null     object
 2   Annual Income       10 non-null     int64 
 3   Defaulted Borrower  10 non-null     object
dtypes: int64(1), object(3)
memory usage: 448.0+ bytes
```

In [5]:
```
x=df.drop('Defaulted Borrower',axis=1)
y=df['Defaulted Borrower']
```

In [6]:
```
df['Marital Status'].value_counts()
```

Out[6]:
```
Marital Status
Single      4
Married     4
Divorced    2
Name: count, dtype: int64
```

In [7]:
```
HO={"Home Owner":{'Yes':1,'No':0}}
df=df.replace(HO)
print(df)
```

```
   Home Owner Marital Status  Annual Income Defaulted Borrower
0           1         Single            125                 No
1           0        Married            100                 No
2           0         Single             70                 No
3           1        Married            120                 No
4           0       Divorced             95                Yes
5           0        Married             60                 No
6           1       Divorced            220                 No
7           0         Single             85                Yes
8           0        Married             75                 No
9           0         Single             90                Yes
```

In [10]:
```
MS={"Marital Status":{'Single':1,'Married':2,'Divorced':3}}
df=df.replace(MS)
print(df)
```

```
   Home Owner  Marital Status  Annual Income Defaulted Borrower
0           1               1            125                 No
1           0               2            100                 No
2           0               1             70                 No
3           1               2            120                 No
4           0               3             95                Yes
5           0               2             60                 No
6           1               3            220                 No
7           0               1             85                Yes
8           0               2             75                 No
9           0               1             90                Yes
```

In [11]:
```
x=df.drop('Defaulted Borrower',axis=1)
y=df['Defaulted Borrower']
```

In [12]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.7,random_state=42)
x_train.shape,x_test.shape
```

Out[12]:
```
((7, 3), (3, 3))
```

In [14]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[14]:
```
▾ RandomForestClassifier

RandomForestClassifier()
```

In [22]:
```
rf=RandomForestClassifier()
```

In [32]:
```
params={'max_depth':[2,3,5,10,20],
       'min_samples_leaf':[5,10,20,50,100,200],
       'n_estimators':[10,25,30,50,100,200]}
```

In [33]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rf,param_grid=params,cv=2,scoring='accuracy')
grid_search.fit(x_train,y_train)
```

Out[33]:

▸ GridSearchCV

▸ estimator: RandomForestClassifier

▸ RandomForestClassifier

In [34]:
```
grid_search.best_score_
```

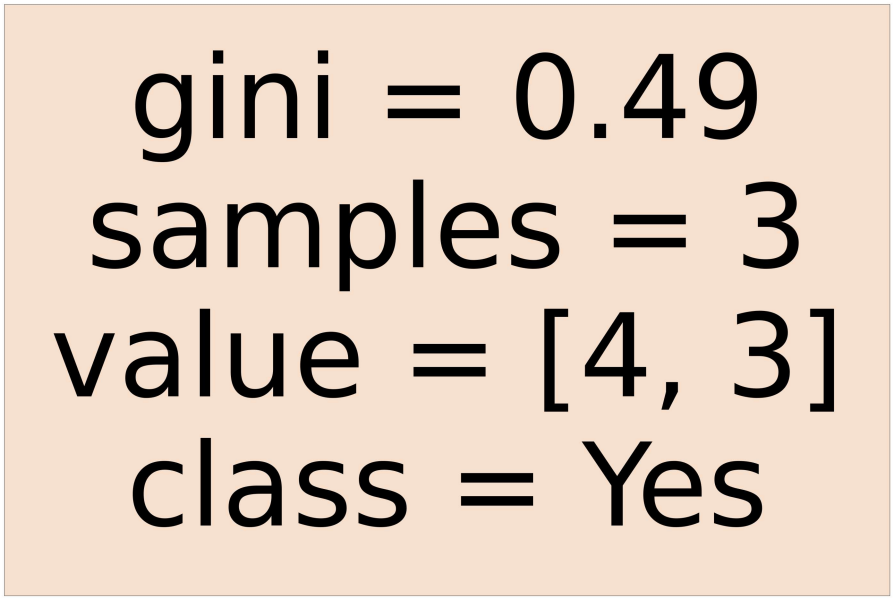
Out[34]:
```
0.5833333333333333
```

In [35]:
```
rf_best=grid_search.best_estimator_
print(rf_best)
```

```
RandomForestClassifier(max_depth=2, min_samples_leaf=5, n_estimators=25)
```

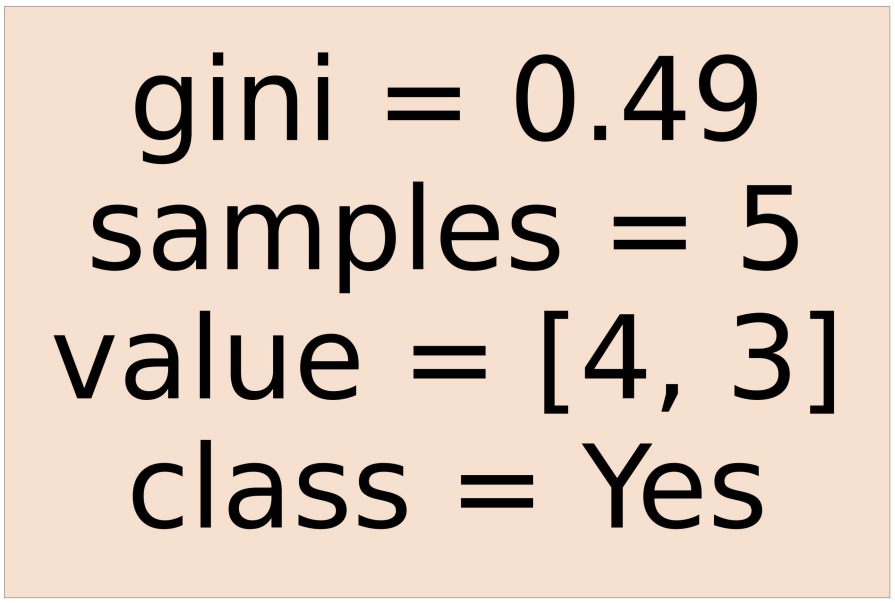
In [41]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[5],feature_names=x.columns,class_names=['Yes','No'],
```

Out[41]:
```
[Text(0.5, 0.5, 'gini = 0.49\nsamples = 3\nvalue = [4, 3]\nclass = Yes')]
```



In [42]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[7],feature_names=x.columns,class_names=['Yes','No'],
```

Out[42]:
```
[Text(0.5, 0.5, 'gini = 0.49\nsamples = 5\nvalue = [4, 3]\nclass = Yes')]
```



In [43]:
```
rf_best.feature_importances_
```

Out[43]:
```
array([0., 0., 0.])
```

In [44]:
```
imp_df=pd.DataFrame({'Varname':x_train.columns,"Imp":rf_best.feature_importances_}
imp_df.sort_values(by="Imp",ascending=False)
```

Out[44]:

	Varname	Imp
0	Home Owner	0.0
1	Marital Status	0.0
2	Annual Income	0.0

In [ ]: