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

In [3]:
```python
data = pd.read_csv('Heart Disease.csv')
data.head(10)
```

Out[3]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	52	1	0	125	212	0	1	168	0	1.0	2	2	3	0
1	53	1	0	140	203	1	0	155	1	3.1	0	0	3	0
2	70	1	0	145	174	0	1	125	1	2.6	0	0	3	0
3	61	1	0	148	203	0	1	161	0	0.0	2	1	3	0
4	62	0	0	138	294	1	1	106	0	1.9	1	3	2	0
5	58	0	0	100	248	0	0	122	0	1.0	1	0	2	1
6	58	1	0	114	318	0	2	140	0	4.4	0	3	1	0
7	55	1	0	160	289	0	0	145	1	0.8	1	1	3	0
8	46	1	0	120	249	0	0	144	0	0.8	2	0	3	0
9	54	1	0	122	286	0	0	116	1	3.2	1	2	2	0

age sex chest pain type (4 values) value 0:typeical angin Value 1:atypical angin value 2:non-anginal pain value 3:asymptomatic trestdps: resting blood pressure(in mm hg on admission to the hospital) chol:serum cholestoral in mg/dl fbs:(fasting blood sugar>120 mg/dl)(1 = true;0 = false) restecg:resting eletrocardiographic results value 0:normal value 1:having ST-T wave abnornality(T wave inversions and/or ST elevation or depression of >0.05mV) value 2:showing probable or definite left ventricular hypertrophy by Estes criteria thalach:maximum heart rate achieved exang:exercise induced angina(1=yes;0 = no) oldpeak = ST depression induced by exercise ST segment value 1:upsloping value 2:flat value 3:downsloping ca:number of major vessel(0-3)colored by flourosopy thal: 3 = normal;6 = fixed defect;7 = reversable defect target: 0:less chance of heart attack, 1=mare chance of heart attack

last 5 rows

In [4]:
```python
data.tail()
```

Out[4]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
1020	59	1	1	140	221	0	1	164	1	0.0	2	0	2	1
1021	60	1	0	125	258	0	0	141	1	2.8	1	1	3	0
1022	47	1	0	110	275	0	0	118	1	1.0	1	1	2	0
1023	50	0	0	110	254	0	0	159	0	0.0	2	0	2	1
1024	54	1	0	120	188	0	1	113	0	1.4	1	1	3	0

Find shape of our Dataset(Number of Rows and Columns)

In [5]:
```python
print("Number of Rows",data.shape[0])
print("Number of Colommns",data.shape[1])
```

```
Number of Rows 1025
Number of Colommns 14
```

Get information about our Dataset like Toatal Number Row,Total Number of colomns,Datatype of Each column And memory Requriment

In [6]:
```python
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1025 entries, 0 to 1024
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       1025 non-null   int64  
 1   sex       1025 non-null   int64  
 2   cp        1025 non-null   int64  
 3   trestbps  1025 non-null   int64  
 4   chol      1025 non-null   int64  
 5   fbs       1025 non-null   int64  
 6   restecg   1025 non-null   int64  
 7   thalach   1025 non-null   int64  
 8   exang     1025 non-null   int64  
 9   oldpeak   1025 non-null   float64
 10  slope     1025 non-null   int64  
 11  ca        1025 non-null   int64  
 12  thal      1025 non-null   int64  
 13  target    1025 non-null   int64  
dtypes: float64(1), int64(13)
memory usage: 112.2 KB
```

Check Null values in the Dataset

In [8]:
```python
data.isnull().sum()
```

Out[8]:
```
age         0
sex         0
cp          0
trestbps    0
chol        0
fbs         0
restecg     0
thalach     0
exang       0
oldpeak     0
slope       0
ca          0
thal        0
target      0
dtype: int64
```

check for Duplicate Date and drop them

In [9]:
```python
data_dup = data.duplicated().any()
print(data_dup)
```

```
True
```

In [10]:
```python
data = data.drop_duplicates()
```

In [12]:
```python
data.shape
```

Out[12]:
```
(302, 14)
```

Get overall Statistics about the Dataset

In [13]:
```python
data.describe()
```

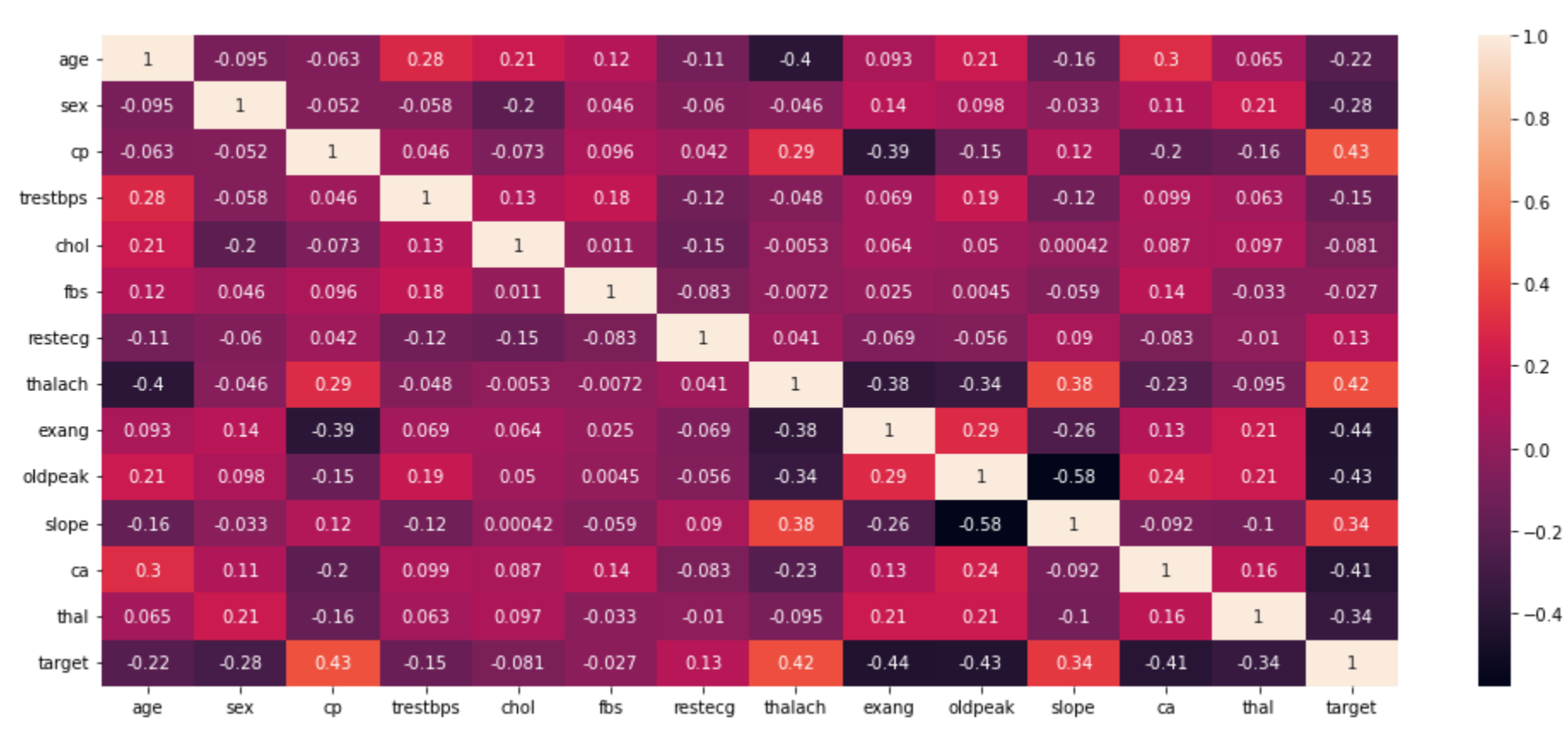
Out[13]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
count	302.00000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000	302.000000
mean	54.42053	0.682119	0.963576	131.602649	246.500000	0.149007	0.526490	149.569536	0.327815	1.043046	1.397351	0.718543	2.314570	0.543046
std	9.04797	0.466426	1.032044	17.563394	51.753489	0.356686	0.526027	22.903527	0.470196	1.161452	0.616274	1.006748	0.613026	0.498970
min	29.00000	0.000000	0.000000	94.000000	126.000000	0.000000	0.000000	71.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	48.00000	0.000000	0.000000	120.000000	211.000000	0.000000	0.000000	133.250000	0.000000	0.000000	1.000000	0.000000	2.000000	0.000000
50%	55.50000	1.000000	1.000000	130.000000	240.500000	0.000000	1.000000	152.500000	0.000000	0.800000	1.000000	0.000000	2.000000	1.000000
75%	61.00000	1.000000	2.000000	140.000000	274.750000	0.000000	1.000000	166.000000	1.000000	1.600000	2.000000	1.000000	3.000000	1.000000
max	77.00000	1.000000	3.000000	200.000000	564.000000	1.000000	2.000000	202.000000	1.000000	6.200000	2.000000	4.000000	3.000000	1.000000

Draw correlation Matrix

In [17]:
```python
plt.figure(figsize=(17,7))
sns.heatmap(data.corr(),annot=True)
```

Out[17]:
```
<AxesSubplot:>
```



How many people have Heart disease,and how many don't have heart disesse in this dataset?

In [18]:
```python
data.columns
```

Out[18]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

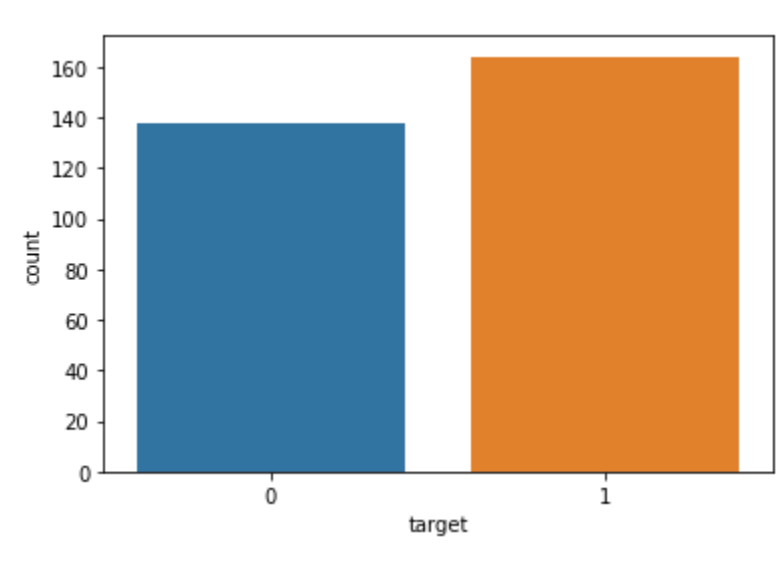
In [19]:
```python
data['target'].value_counts()
```

Out[19]:
```
1    164
0    138
Name: target, dtype: int64
```

In [26]:
```python
sns.countplot(data['target'])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[26]:
```
<AxesSubplot:xlabel='target', ylabel='count'>
```



Find count of male & female in this Dataset

In [27]:
```python
data.columns
```

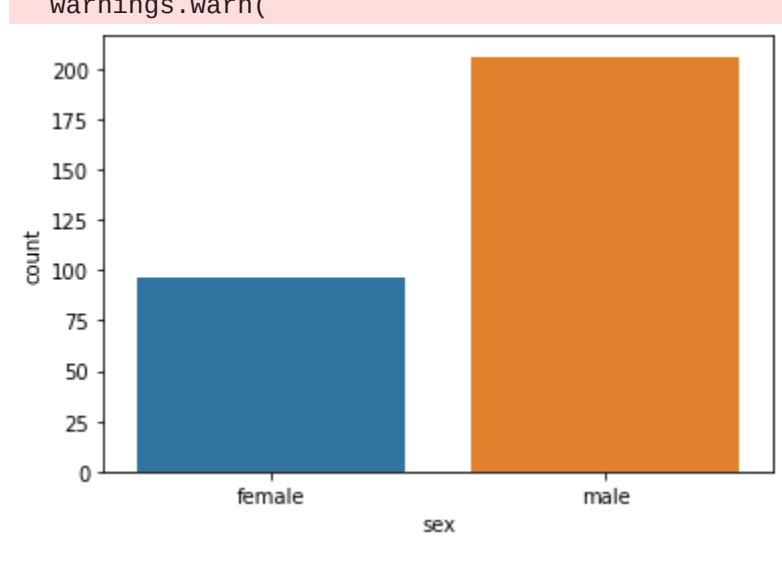
Out[27]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [28]:
```python
data['sex'].value_counts()
```

Out[28]:
```
1    206
0     96
Name: sex, dtype: int64
```

In [31]:
```python
sns.countplot(data['sex'])
plt.xticks([0,1],['female','male'])
plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

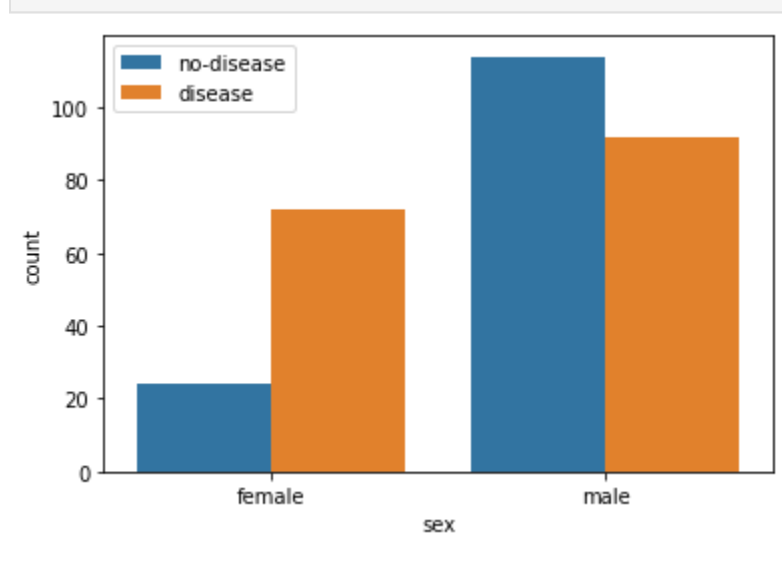


Find genber distribution according to the Target varible

In [32]:
```python
data.columns
```

Out[32]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

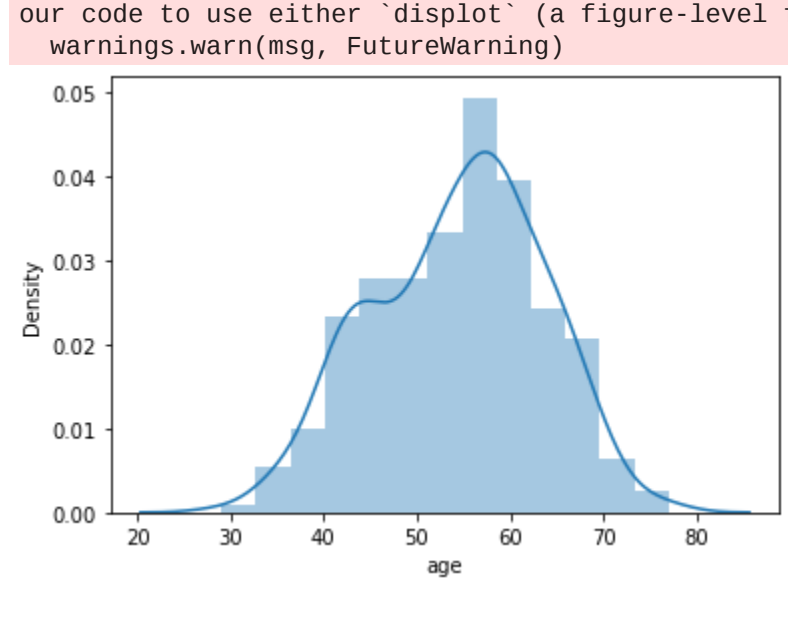
In [36]:
```python
sns.countplot(x='sex',hue="target",data=data)
plt.xticks([1,0],['male','female'])
plt.legend(labels=['no-disease','disease'])
plt.show()
```



Check Age distribution in the Dataset

In [40]:
```python
sns.distplot(data['age'])
plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

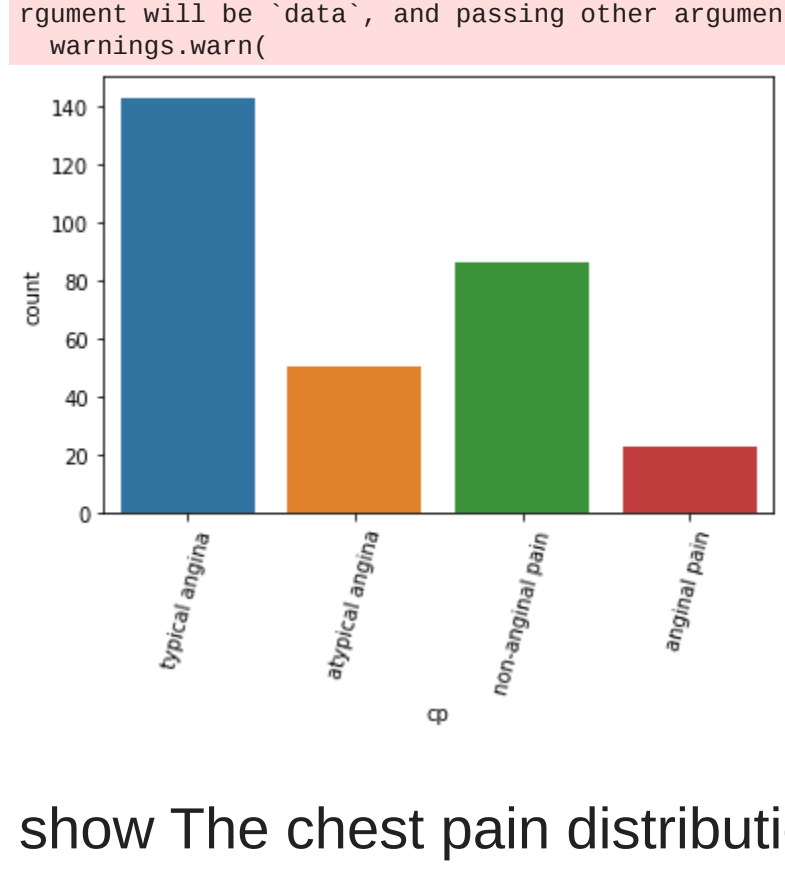


Check chest Pain type

chest pain type(4 values) value 0:typical angina value 1:atypical angina value 2:non-anginal pain value 3:non-anginal pain

In [73]:
```python
sns.countplot(data['cp'])
plt.xticks([0,1,2,3],["typical angina","atypical angina","non-anginal pain","anginal pain"])
plt.xticks(rotation=75)
plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

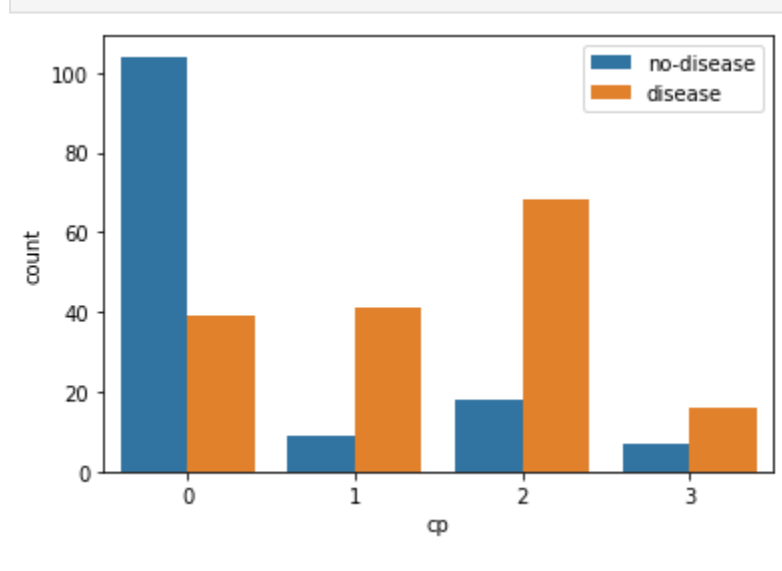


show The chest pain distribution as per target variable

In [45]:
```python
data.columns
```

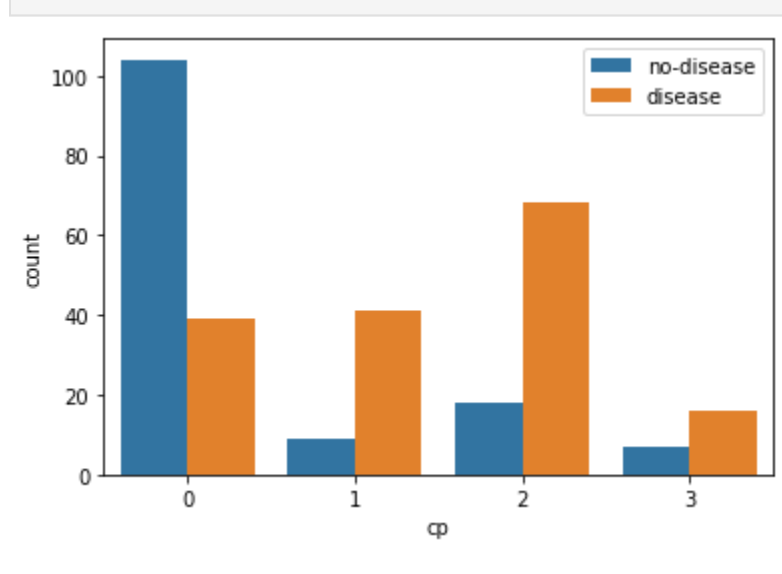
Out[45]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [47]:
```python
sns.countplot(x="cp",hue="target",data=data)
plt.legend(labels=["no-disease","disease"])
plt.show()
```



Show fasting blood sugar distribution according to target variable

In [48]:
```python
sns.countplot(x="cp",hue="target",data=data)
plt.legend(labels=["no-disease","disease"])
plt.show()
```



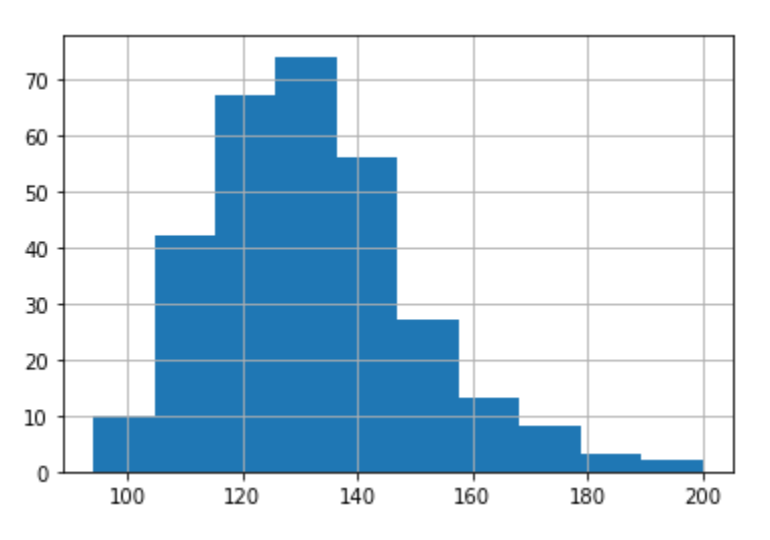
Check Resting blood pressure distribution

In [50]:
```python
data.columns
```

Out[50]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [51]:
```python
data['trestbps'].hist()
```

Out[51]:
```
<AxesSubplot:>
```



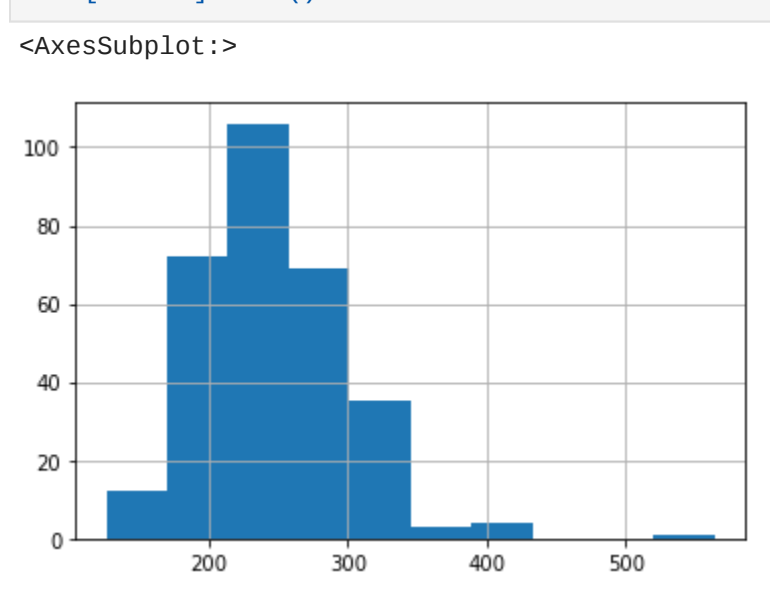
show distridution of serum cholesterol

In [54]:
```python
data.columns
```

Out[54]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [55]:
```python
data['chol'].hist()
```

Out[55]:
```
<AxesSubplot:>
```



plot continuous variables

In [57]:
```python
data.columns
```

Out[57]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [60]:
```python
cate_val=[]
cont_val=[]

for column in data.columns:
    if data[column].nunique() <=10:
        cate_val.append(column)
    else:
        cont_val.append(column)
```

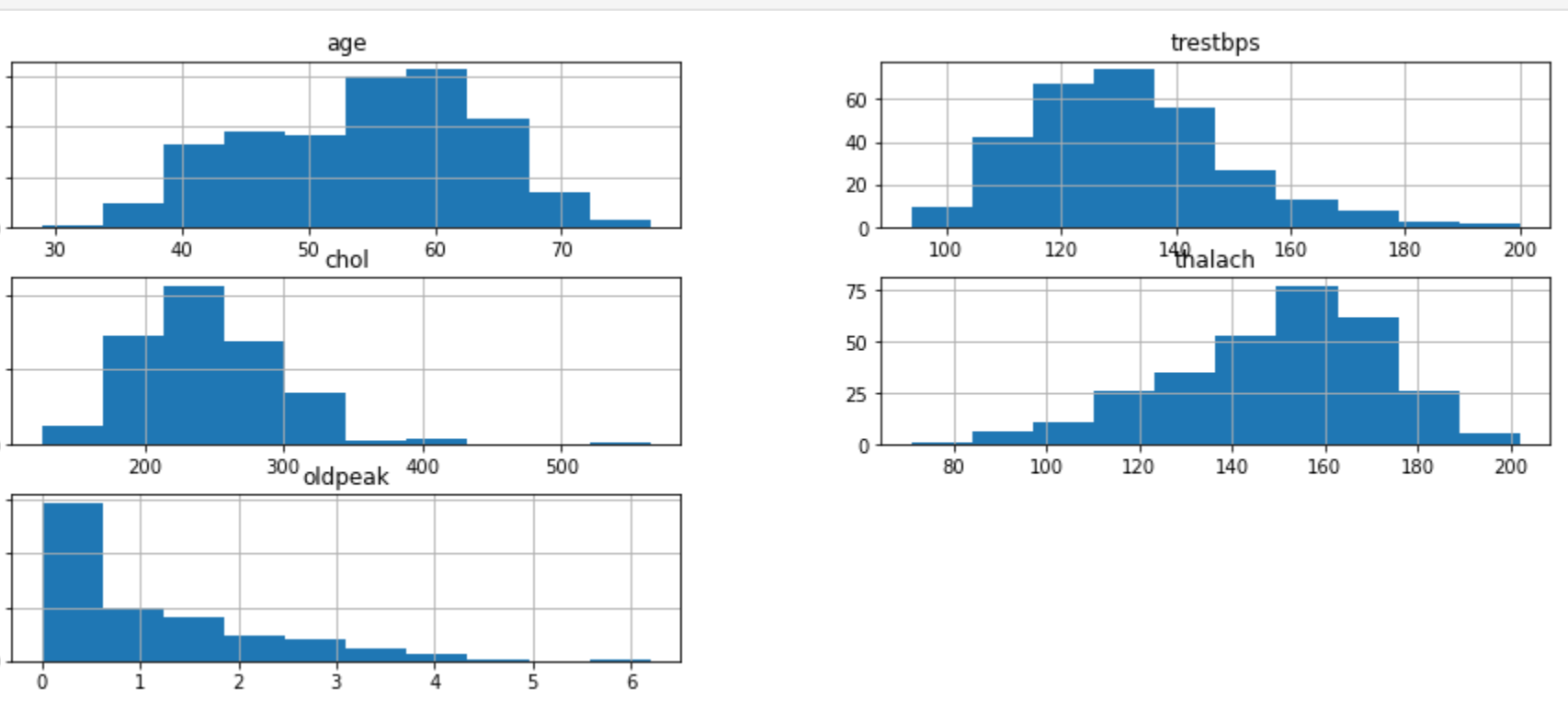
In [61]:
```python
cate_val
```

Out[61]:
```
['sex', 'cp', 'fbs', 'restecg', 'exang', 'slope', 'ca', 'thal', 'target']
```

In [62]:
```python
cont_val
```

Out[62]:
```
['age', 'trestbps', 'chol', 'thalach', 'oldpeak']
```

In [67]:
```python
data.hist(cont_val,figsize=(15,6))
plt.show()
```



In [ ]: