In [1]:
```python
# Importing all the libraries that we need.
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

In [2]:
```python
# Importing our dataset.
df = pd.read_csv("heart.csv")
```

In [3]:
```python
# checking first five rows by calling df.head()
df.head()
```

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

In [4]:
```python
df.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

In [5]:
```python
# take a look at the colum names.
df.columns.values
```

Out[5]:
```
array(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg',
       'thalach', 'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype=object)
```

In [6]:
```python
# checking for null values.
df.isna().sum()
```

Out[6]:
```
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
```

In [7]:
```python
# consise summary of our dataset.
df.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
```

In [8]:
```python
# Generating descriptive statistics.
df.describe()
```

Out[8]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
count	1025.000000	1025.000000	1025.000000	1025.000000	1025.00000	1025.000000	1025.000000	1025.000000	1025.000000	1025.000000	1025.000000	1025.000000	1025.000000	1025.000000
mean	54.434146	0.695610	0.942439	131.611707	246.00000	0.149268	0.529756	149.114146	0.336585	1.071512	1.385366	0.754146	2.323902	0.513171
std	9.072290	0.460373	1.029641	17.516718	51.59251	0.356527	0.527878	23.005724	0.472772	1.175053	0.617755	1.030798	0.620660	0.500070
min	29.000000	0.000000	0.000000	94.000000	126.00000	0.000000	0.000000	71.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	48.000000	0.000000	0.000000	120.000000	211.00000	0.000000	0.000000	132.000000	0.000000	0.000000	1.000000	0.000000	2.000000	0.000000
50%	56.000000	1.000000	1.000000	130.000000	240.00000	0.000000	1.000000	152.000000	0.000000	0.800000	1.000000	0.000000	2.000000	1.000000
75%	61.000000	1.000000	2.000000	140.000000	275.00000	0.000000	1.000000	166.000000	1.000000	1.800000	2.000000	1.000000	3.000000	1.000000
max	77.000000	1.000000	3.000000	200.000000	564.00000	1.000000	2.000000	202.000000	1.000000	6.200000	2.000000	4.000000	3.000000	1.000000

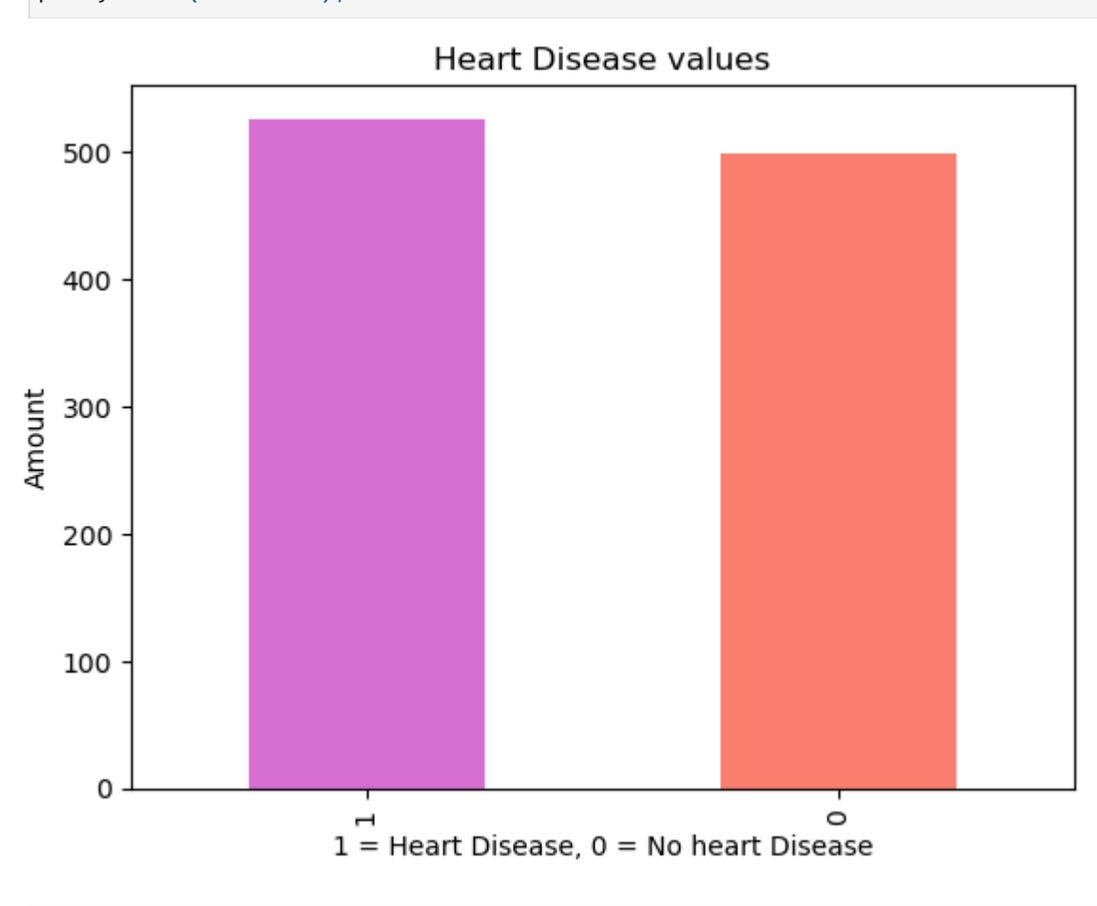
In [9]:
```python
Questions = ["1. How many people have heart disease and how many people doesn't have heart disease? ",
            "2. People of which sex has most heart disease?",
            "3. People of which sex has which type of chest pain most?",
            "4. People with which chest pain are most pron to have heart disease?",
            "5.Show Fasting  Bloood Sugar Distribution According to Target Variable?",
            "6.Show Rating Blood Pressure Distribution?",
            "7.Show Plot Countinuous Variables?"]
Questions
```

Out[9]:
```
["1. How many people have heart disease and how many people doesn't have heart disease? ",
 '2. People of which sex has most heart disease?',
 '3. People of which sex has which type of chest pain most?',
 '4. People with which chest pain are most pron to have heart disease?',
 '5.Show Fasting  Bloood Sugar Distribution According to Target Variable?',
 '6.Show Rating Blood Pressure Distribution?',
 '7.Show Plot Countinuous Variables?']
```

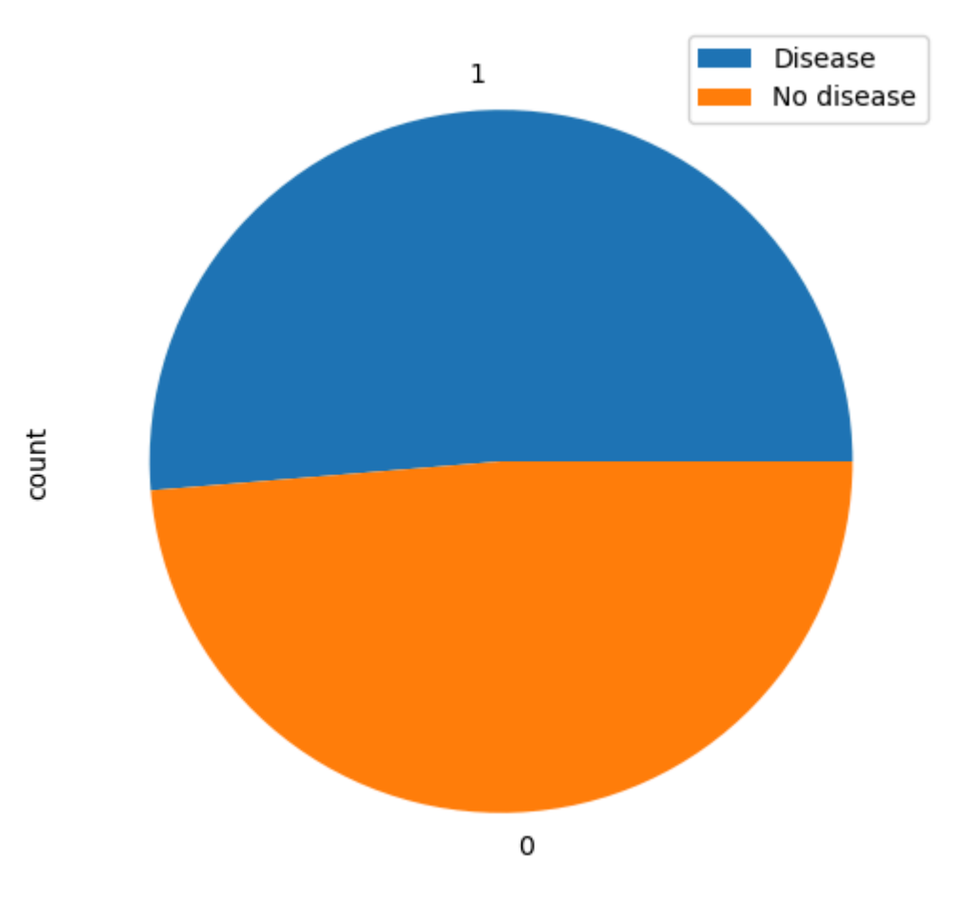
In [10]:
```python
# Let's find the answer of first questions.

# 1.1. How many people have heart disease and how many people doesn't have heart disease?

# getting the values
df.target.value_counts()
```

Out[10]:
```
target
1    526
0    499
Name: count, dtype: int64
```

In [11]:
```python
# plotting bar chart.
df.target.value_counts().plot(kind = 'bar', color=["orchid", "salmon"])
plt.title("Heart Disease values")
plt.xlabel("1 = Heart Disease, 0 = No heart Disease")
plt.ylabel("Amount");
```



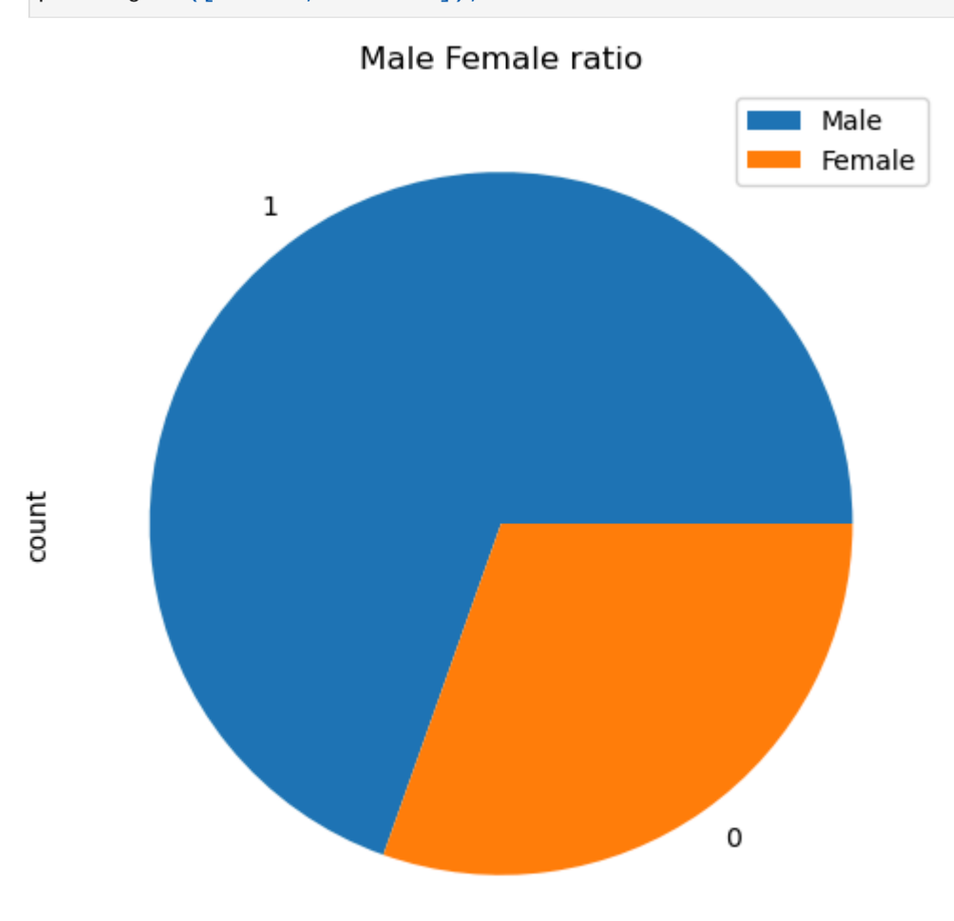
In [12]:
```python
# plotting a pie chart
df.target.value_counts().plot(kind = 'pie', figsize = (8,6))
plt.legend(["Disease", "No disease"]);
```



In [13]:
```python
# '0' represent 'Female'

# '1' represent 'Male'

# '0' represent 'No disease'

# '1' represent 'Disease'

# Now Lets check how many 'Male' and 'Female' are in the dataset

df.sex.value_counts()
```

Out[13]:
```
sex
1    713
0    312
Name: count, dtype: int64
```

In [14]:
```python
# platting a pie chart
df.sex.value_counts().plot(kind = 'pie', figsize = (8,6))
plt.title('Male Female ratio')
plt.legend(['Male','Female']);
```

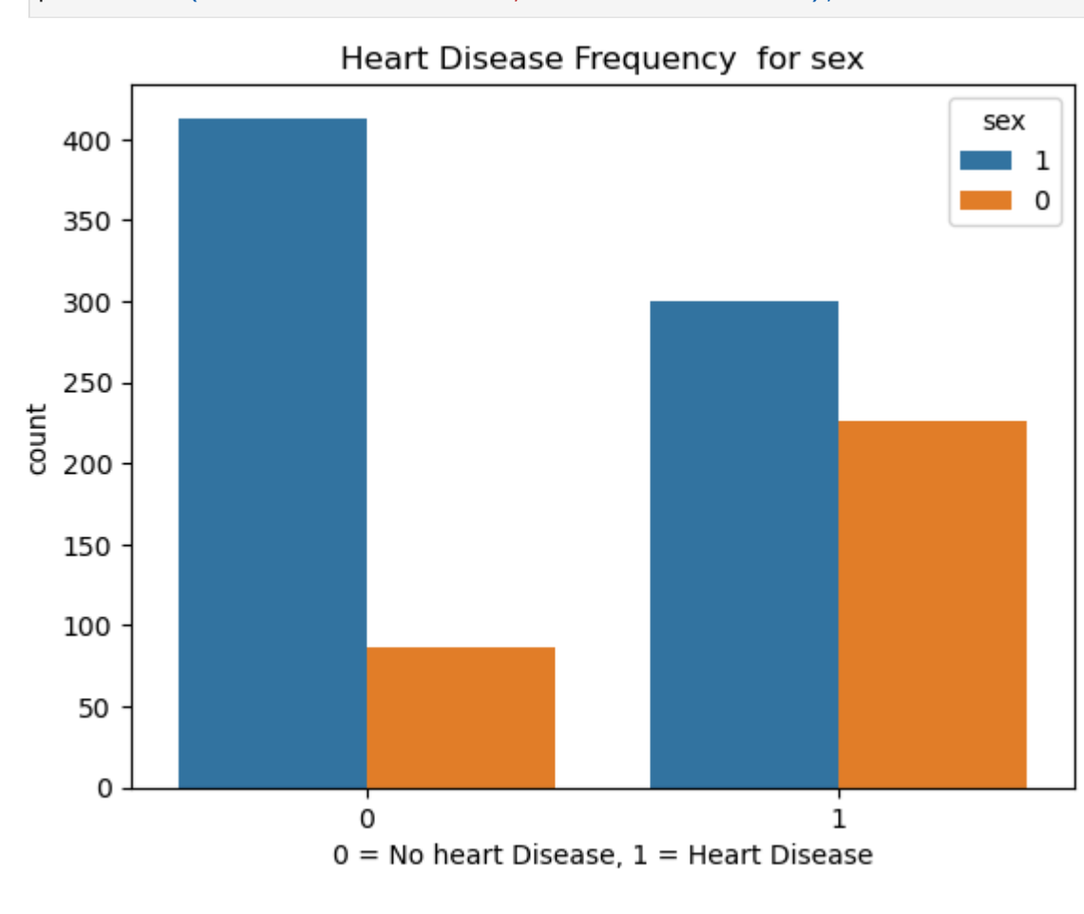


In [15]:
```python
# Let's find the answer of our 2nd question.

# 2. People of which sex has most heart disease?

pd.crosstab(df.target, df.sex)
```

Out[15]:

sex	0	1
target		
0	86	413
1	226	300

In [16]:
```python
#Convert columns to string type
df['sex']= df['sex'].astype(str)
df['target']= df['target'].astype(str)

#Plot the countplot
sns.countplot(x ='target', data = df, hue = 'sex')
plt.title("Heart Disease Frequency  for sex")
plt.xlabel("0 = No heart Disease, 1 = Heart Disease");
```

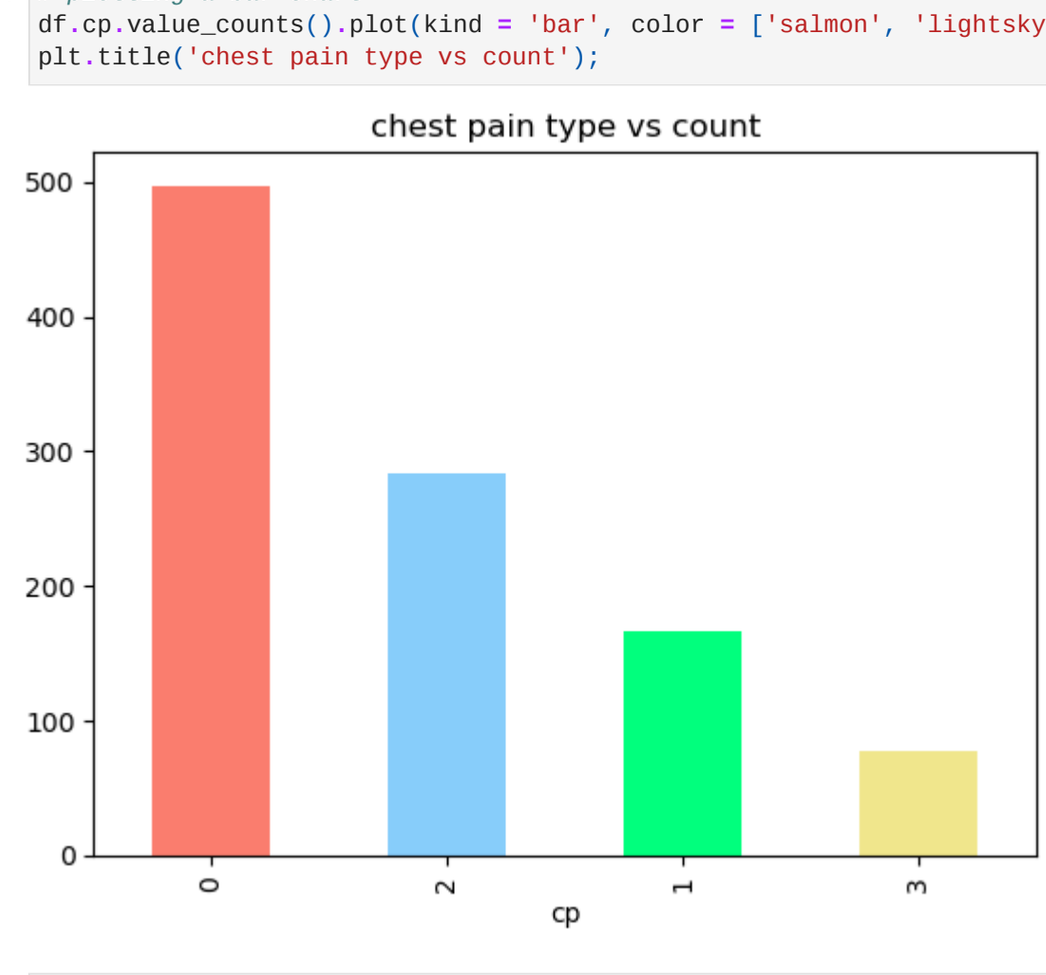


In [17]:
```python
# Number of  male is more than double in our dataset than female.

# More than 45% male has heart disease amd 75% female has heart disease.
```

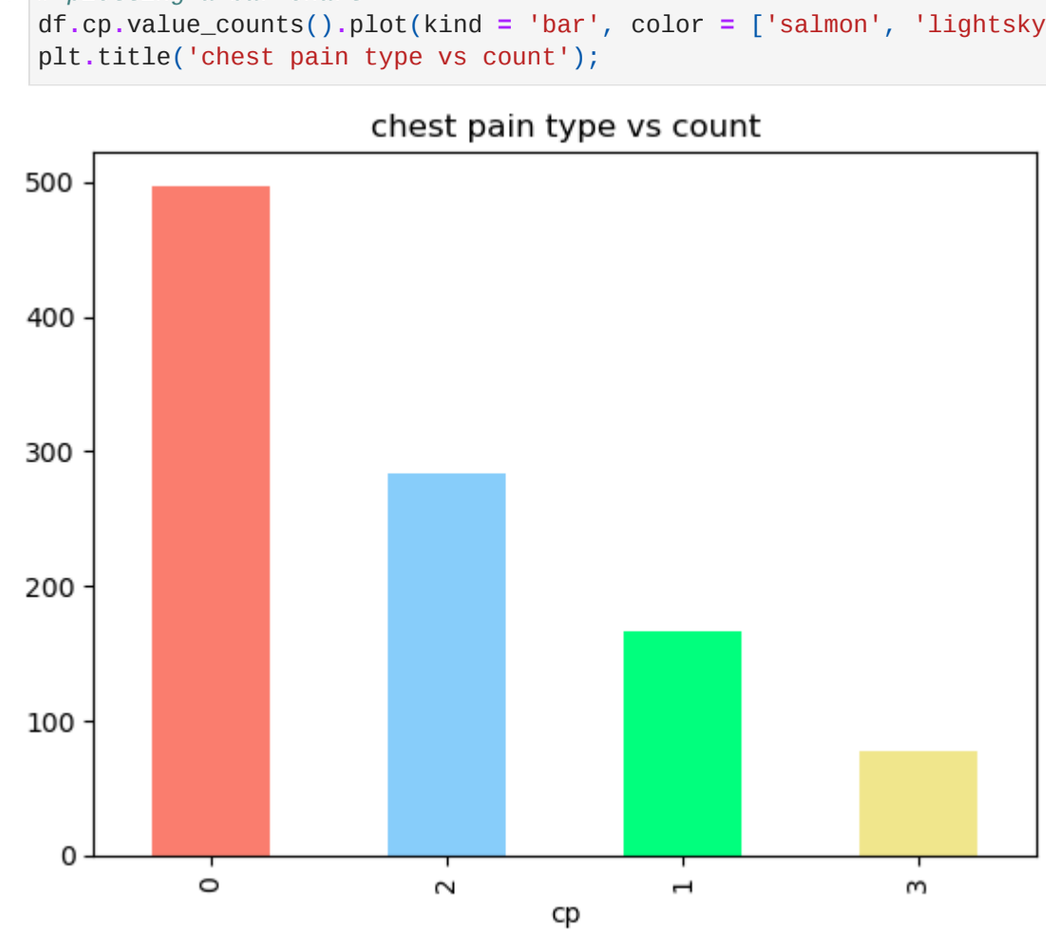
In [18]:
```python
# let's move to question 3

# 3. People of which sex has which type of chest pain most?

# counting value for different chest pain
df.cp.value_counts()
```

Out[18]:
```
cp
0    497
2    284
1    167
3     77
Name: count, dtype: int64
```

In [19]:
```python
# plotting a bar chart
df.cp.value_counts().plot(kind = 'bar', color = ['salmon', 'lightskyblue', 'springgreen', 'khaki'])
plt.title('chest pain type vs count');
```



In [20]:
```python
# plotting a bar chart
df.cp.value_counts().plot(kind = 'bar', color = ['salmon', 'lightskyblue', 'springgreen', 'khaki'])
plt.title('chest pain type vs count');
```

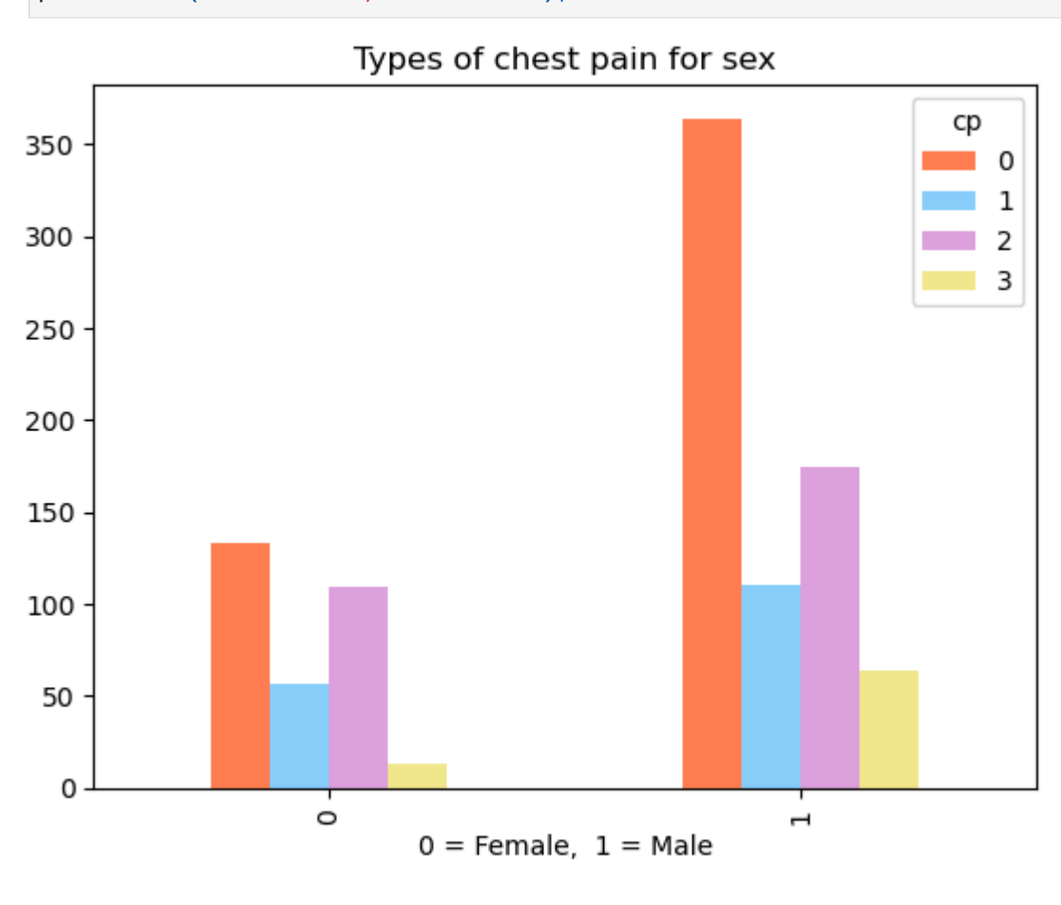


In [21]:
```python
pd.crosstab(df.sex, df.cp)
```

Out[21]:

cp	0	1	2	3
sex				
0	133	57	109	13
1	364	110	175	64

In [22]:
```python
pd.crosstab(df.sex, df.cp).plot(kind = 'bar', color = ['coral', 'lightskyblue', 'plum', 'khaki'])
plt.title('Types of chest pain for sex')
plt.xlabel('0 = Female,  1 = Male');
```



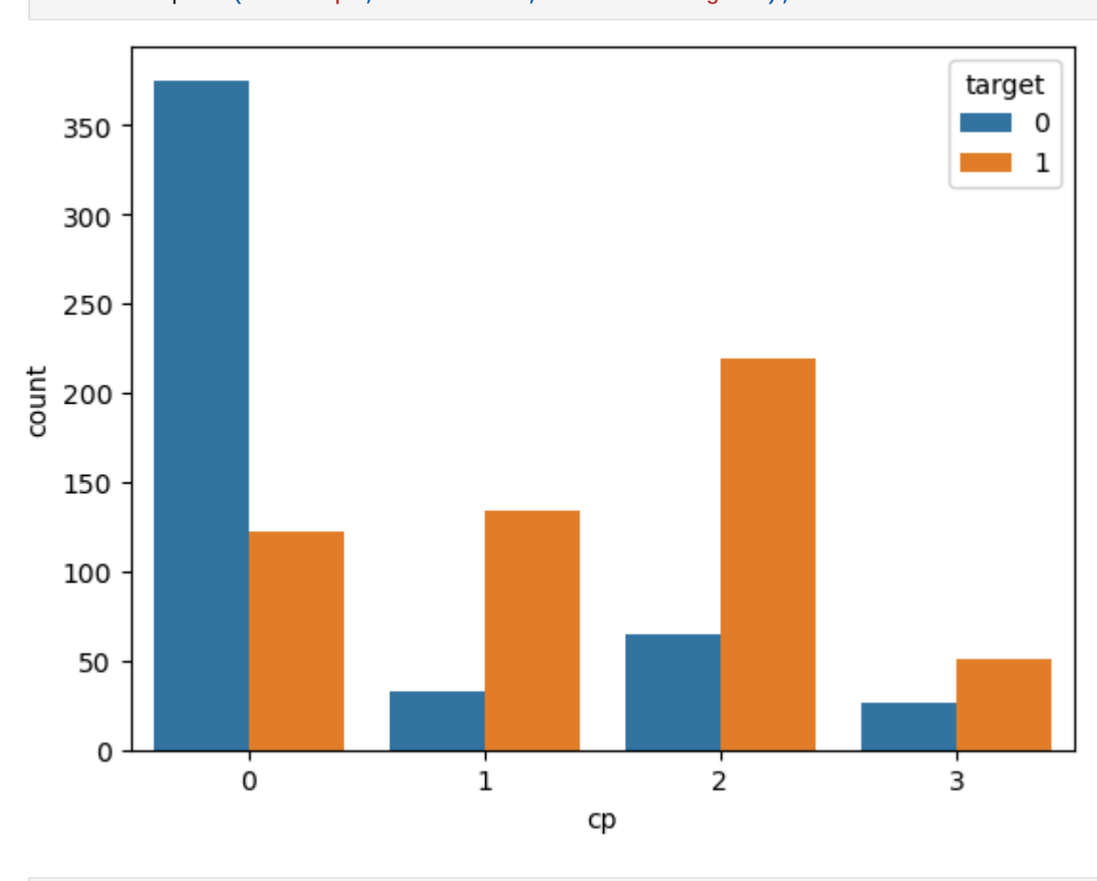
In [23]:
```python
# Most of 'male' has 'type 0'  chest pain and Least of 'Male' has 'type 4' pain.

# in case of 'Female' 'type 0' and 'type 2' percentage is almost same.
```

In [24]:
```python
# Now question 4!

#4. People with which chest pain are most pron to have heart disease?
pd.crosstab(df.cp, df.target)
```

Out[24]:

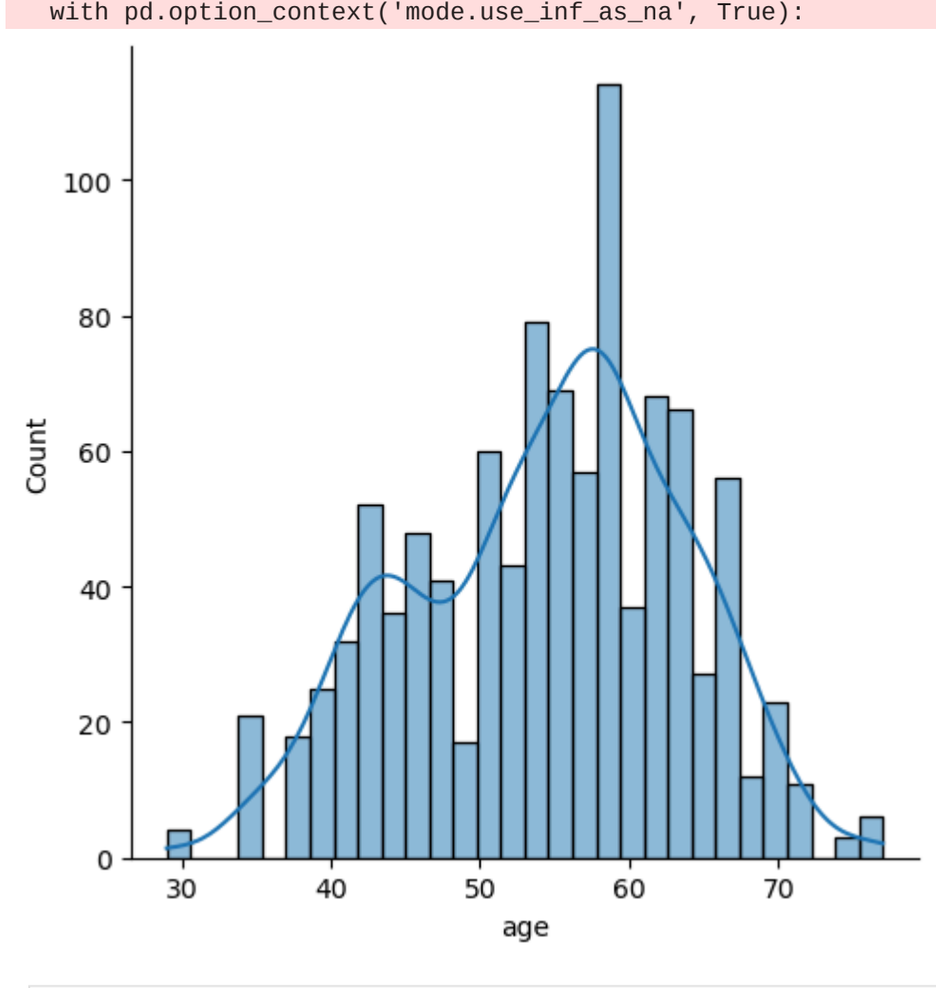
target	0	1
cp		
0	375	122
1	33	134
2	65	219
3	26	51

In [25]:
```python
#Convert columns to string type
df['sex']= df['sex'].astype(str)
df['target']= df['target'].astype(str)
sns.countplot(x = 'cp', data = df, hue = 'target');
```



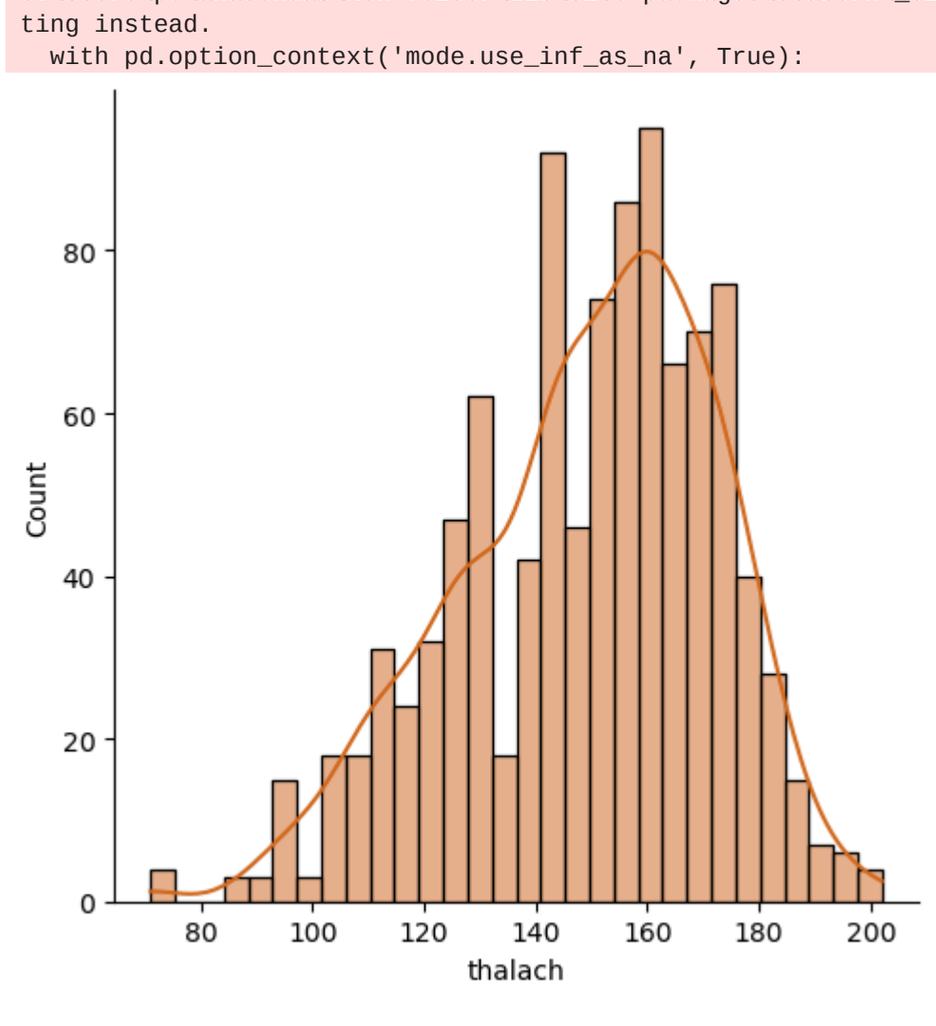
In [26]:
```python
#Most of people who has 'type 0' chest pain has less chance of heart disease.

#And we see the opposite for other types.

#Now Let's take Look at our age column.

#Create a distribution plot with normal distribution curve
sns.displot( x = 'age', data = df, bins = 30, kde = True);
```

```
C:\Users\pc\anaconda3\New folder\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before opera
ting instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



In [27]:
```python
# '58-59' year old people are most in the dataset.

#Let's plot another distribution plot for 'Maximum heart rate'
sns.displot( x = 'thalach', data = df, bins = 30, kde = True, color = 'chocolate');
```

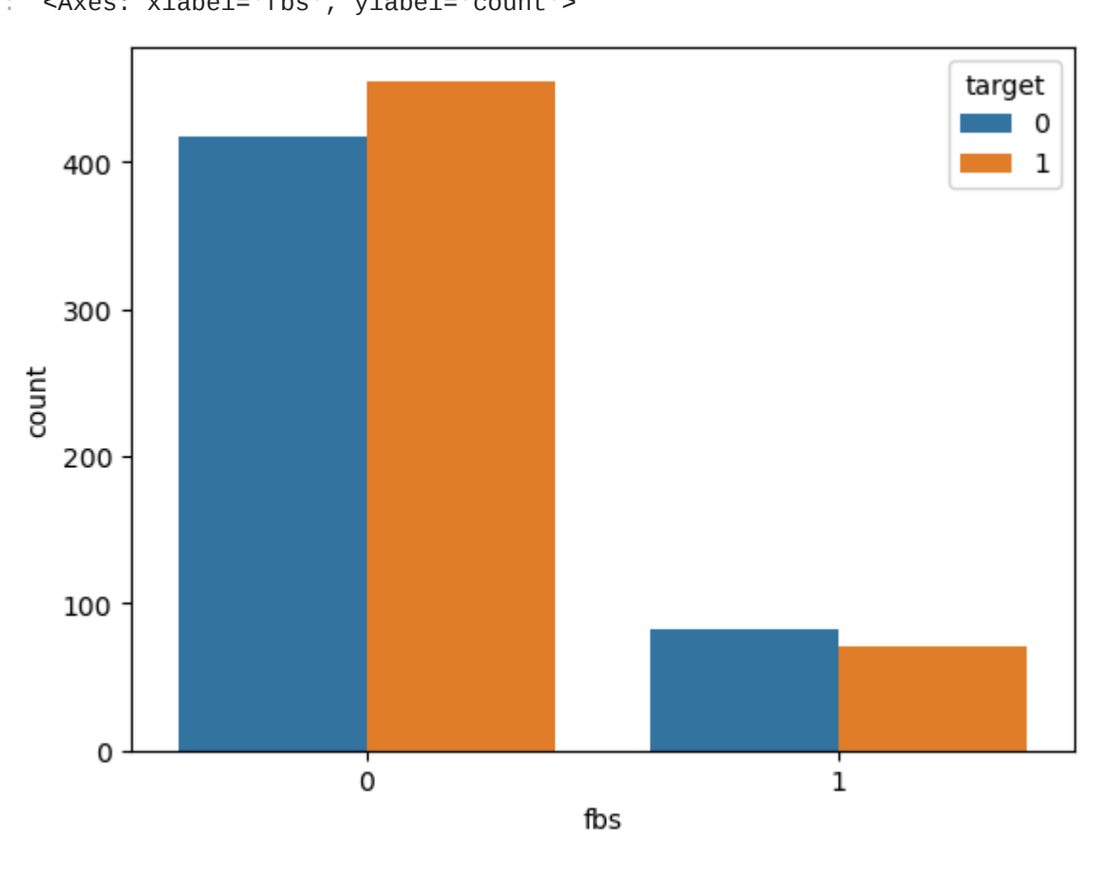
```
C:\Users\pc\anaconda3\New folder\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before opera
ting instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



In [28]:
```python
#From this plot we get a clear overview about Maximum heart rate represented by 'thaiach'
```

In [29]:
```python
# Now question 5!

#5. Show Fasting  Bloood Sugar Distribution According to Target Variable
#Convert columns to string type
df['sex']= df['sex'].astype(str)
df['target']= df['target'].astype(str)
sns.countplot(x="fbs", hue="target", data= df)
```

Out[29]: <Axes: xlabel='fbs', ylabel='count'>

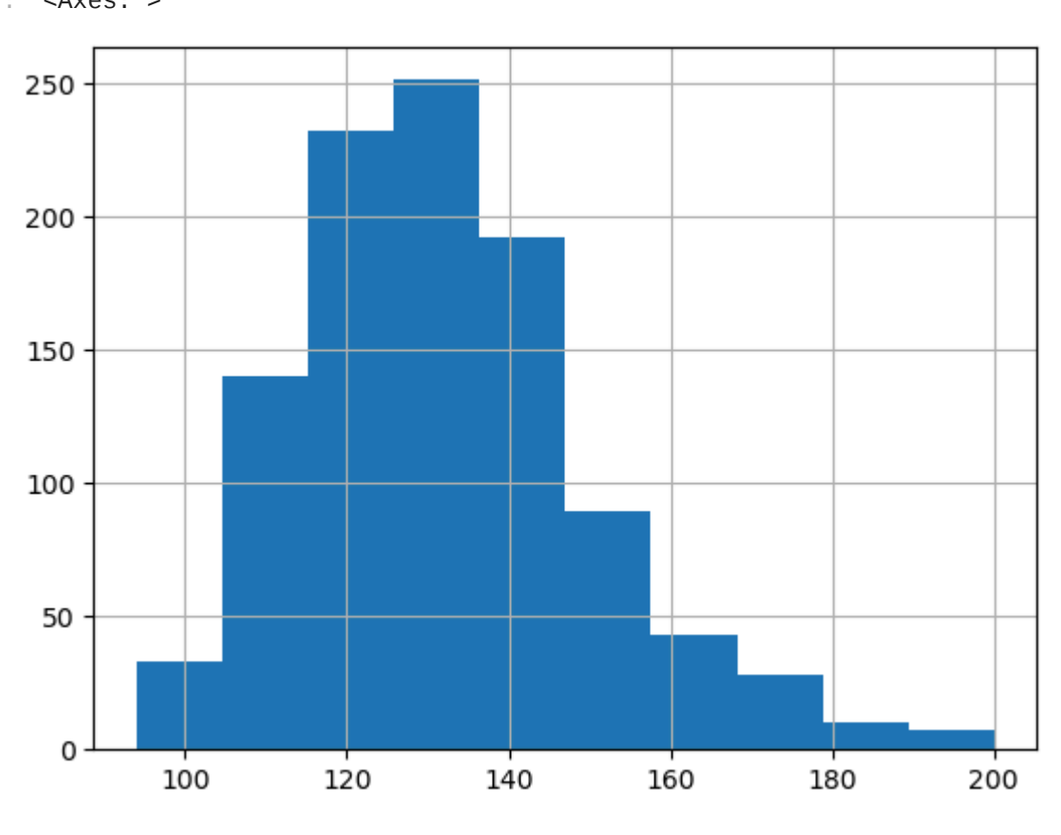


In [30]:
```python
# Now question 6!

#6. Show Rating Blood Pressure Distribution
df.columns
```

Out[30]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [29]:
```python
df["trestbps"].hist()
```

Out[29]: <Axes: >



In [30]:
```python
# Now question 7!

#7. Show Plot Countinuous Variables
```

In [31]:
```python
df.columns
```

Out[31]:
```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

In [32]:
```python
cate_val=[]
cont_val=[]

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

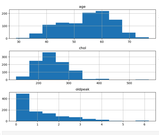
In [33]:
```python
cate_val
```

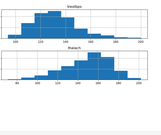
Out[33]:
```
['sex', 'cp', 'fbs', 'restecg', 'exang', 'slope', 'ca', 'thal', 'target']
```

In [34]:
```python
cont_val
```

Out[34]:
```
['age', 'trestbps', 'chol', 'thalach', 'oldpeak']
```

In [35]:
```python
df.hist(cont_val,figsize=(15,6))
plt.tight_layout()
plt.show()
```





In [ ]: