In [90]:

```
from pandas import *
from seaborn import *
from sklearn.model_selection import train_test_split,cross_val_score,GridSearchCV,Randomize
from sklearn.metrics import confusion_matrix,r2_score
from sklearn.ensemble import RandomForestClassifier,ExtraTreesClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import MinMaxScaler,StandardScaler
from numpy import *
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
from sklearn.feature_selection import SelectKBest,chi2
from mpl_toolkits import mplot3d
from sklearn.decomposition import PCA
```

In [21]:

```
heart=read_csv('heart.csv')
```

In [3]:

```
heart
```

Out[3]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
298	57	0	0	140	241	0	1	123	1	0.2	1	0	3	0
299	45	1	3	110	264	0	1	132	0	1.2	1	0	3	0
300	68	1	0	144	193	1	1	141	0	3.4	1	2	3	0
301	57	1	0	130	131	0	1	115	1	1.2	1	1	3	0
302	57	0	1	130	236	0	0	174	0	0.0	1	1	2	0

303 rows × 14 columns

In [4]:

```
def pdf(y):
    o=[]
    m=mean(y)
    s=std(y)
    for i in y:
        o.append(1/(s*sqrt(2*pi))*exp(-(i-m)**2/(2*s**2)))
    return o
```

In [5]:

```
def per(y):
    l=[]
    q1,q2=percentile(sorted(y),[25,75])
    iqr=q2-q1
    low=q1-(1.5*iqr)
    high=q2+(1.5*iqr)
    l.append(low)
    l.append(high)
    return l
```

In [6]:

```
l=per(heart.age)
```

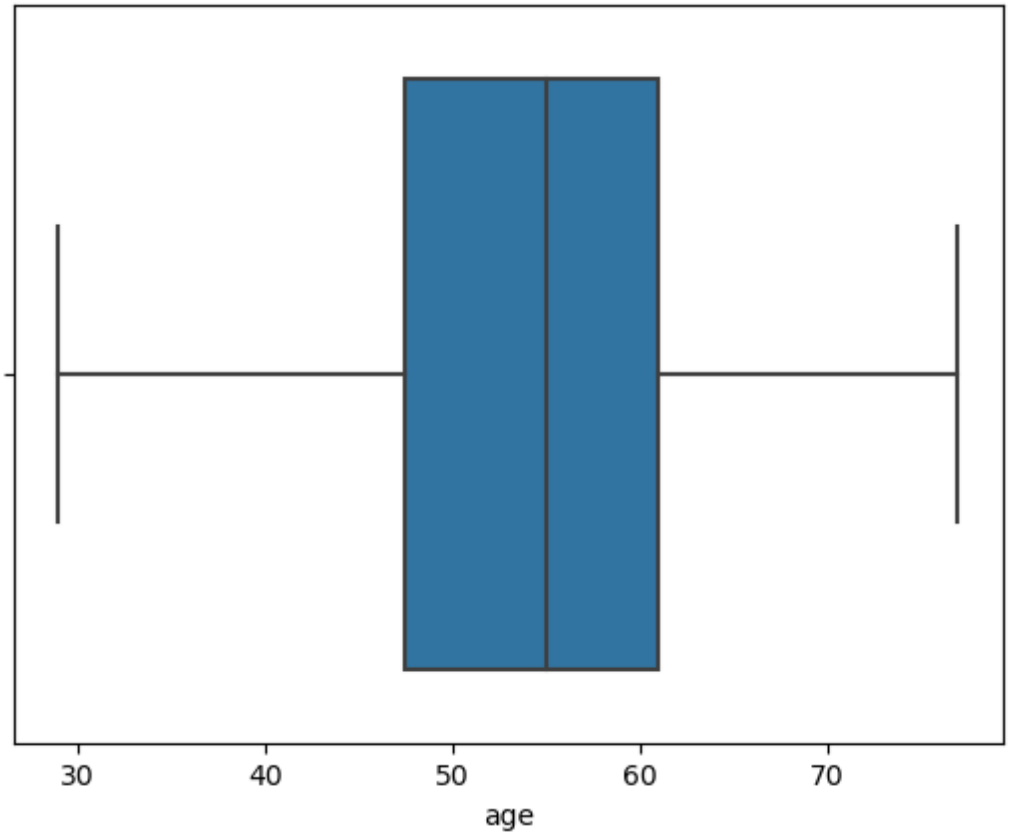
In [22]:

```
boxplot(heart.age)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variable as a keyword arg: x. From version 0.12, t
he 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[22]:

```
<AxesSubplot:xlabel='age'>
```



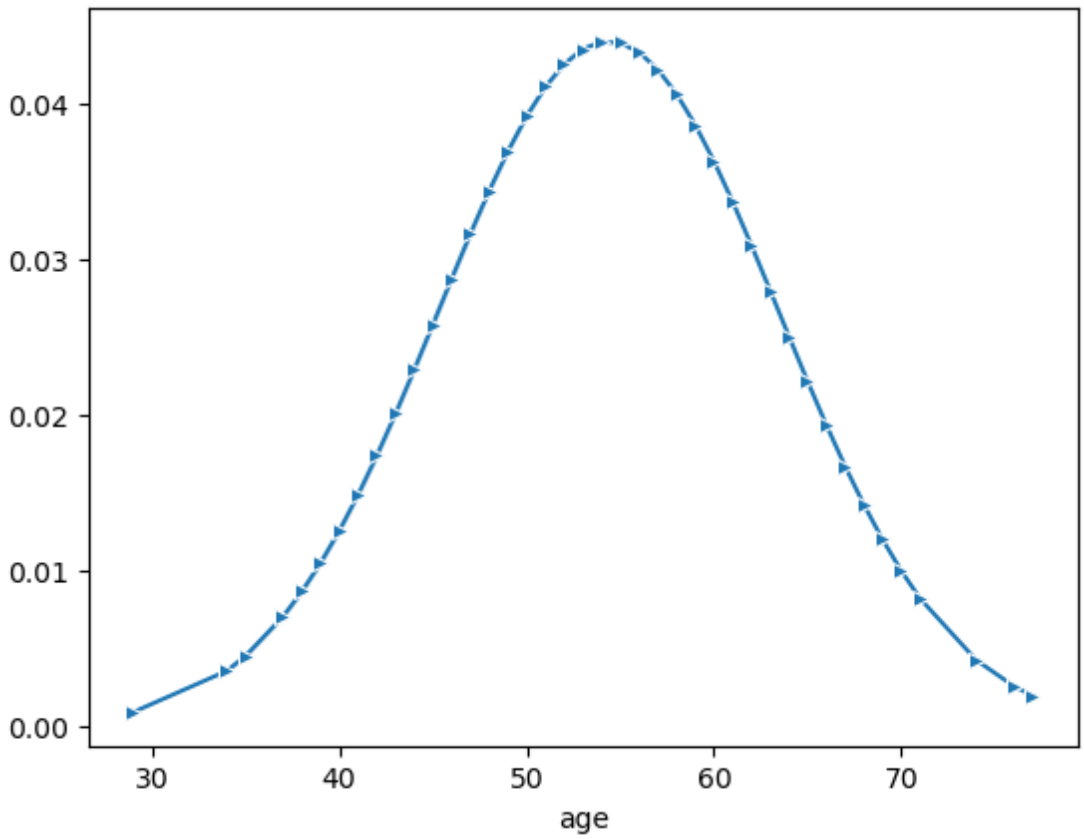
In [23]:

```
lineplot(heart.age,pdf(heart.age),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[23]:

```
<AxesSubplot:xlabel='age'>
```



In [14]:

```
heart.trestbps
```

Out[14]:

```
0      145
1      130
2      130
3      120
4      120
      ...
298    140
299    110
300    144
301    130
302    130
Name: trestbps, Length: 303, dtype: int64
```

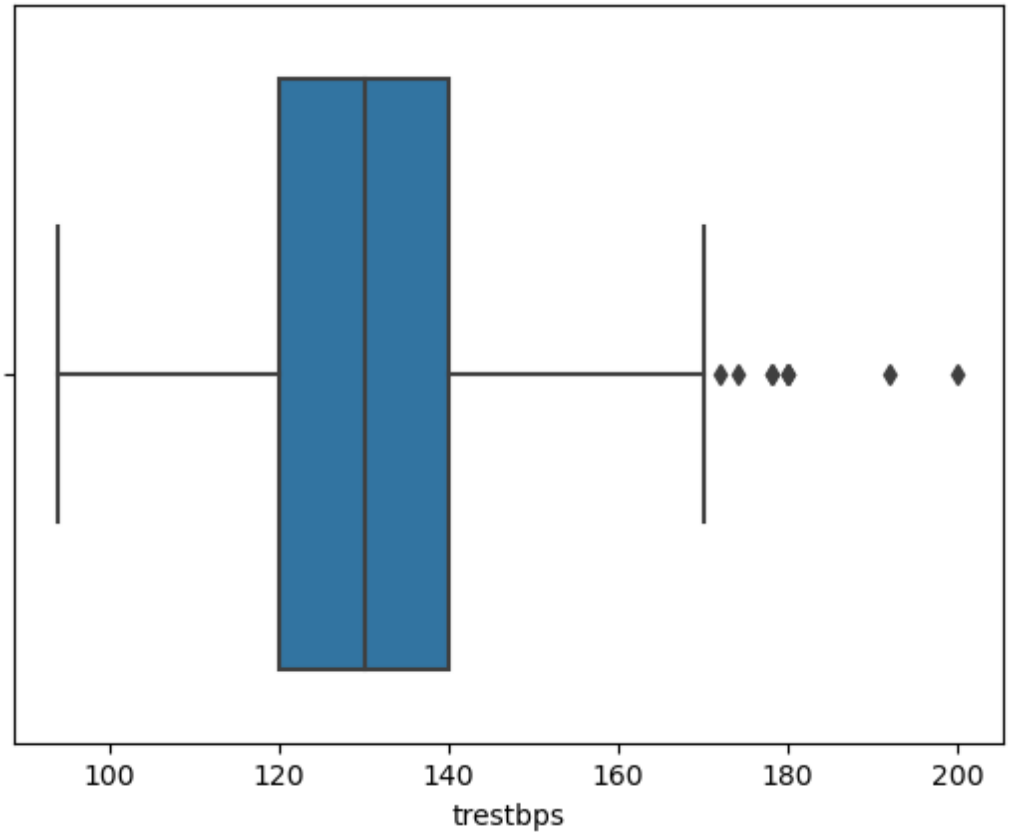
In [24]:

```
boxplot(heart.trestbps)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variable as a keyword arg: x. From version 0.12, t
he 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[24]:

```
<AxesSubplot:xlabel='trestbps'>
```



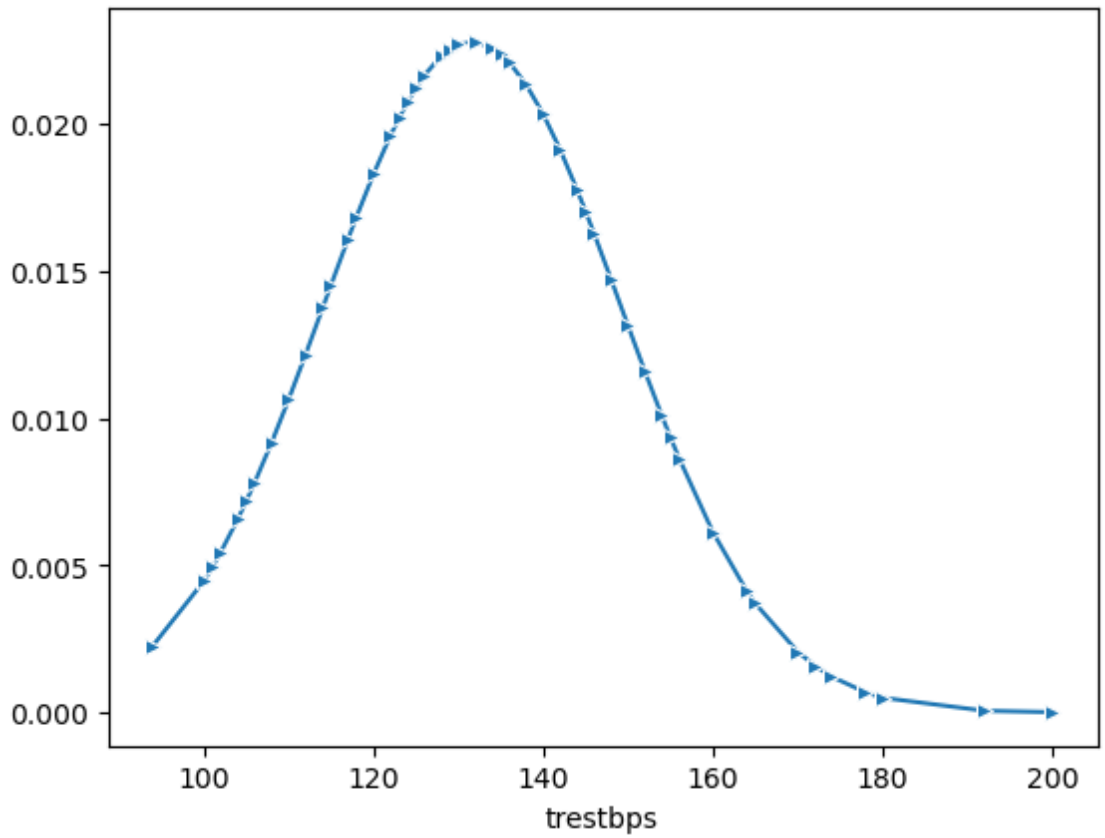
In [25]:

```
lineplot(heart.trestbps,pdf(heart.trestbps),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[25]:

```
<AxesSubplot:xlabel='trestbps'>
```



In [27]:

```
l=per(heart.trestbps)
l
```

Out[27]:

```
[90.0, 170.0]
```

In [28]:

```
heart=heart[heart.trestbps<l[1]]
heart=heart[heart.trestbps>l[0]]
```

After cleaning

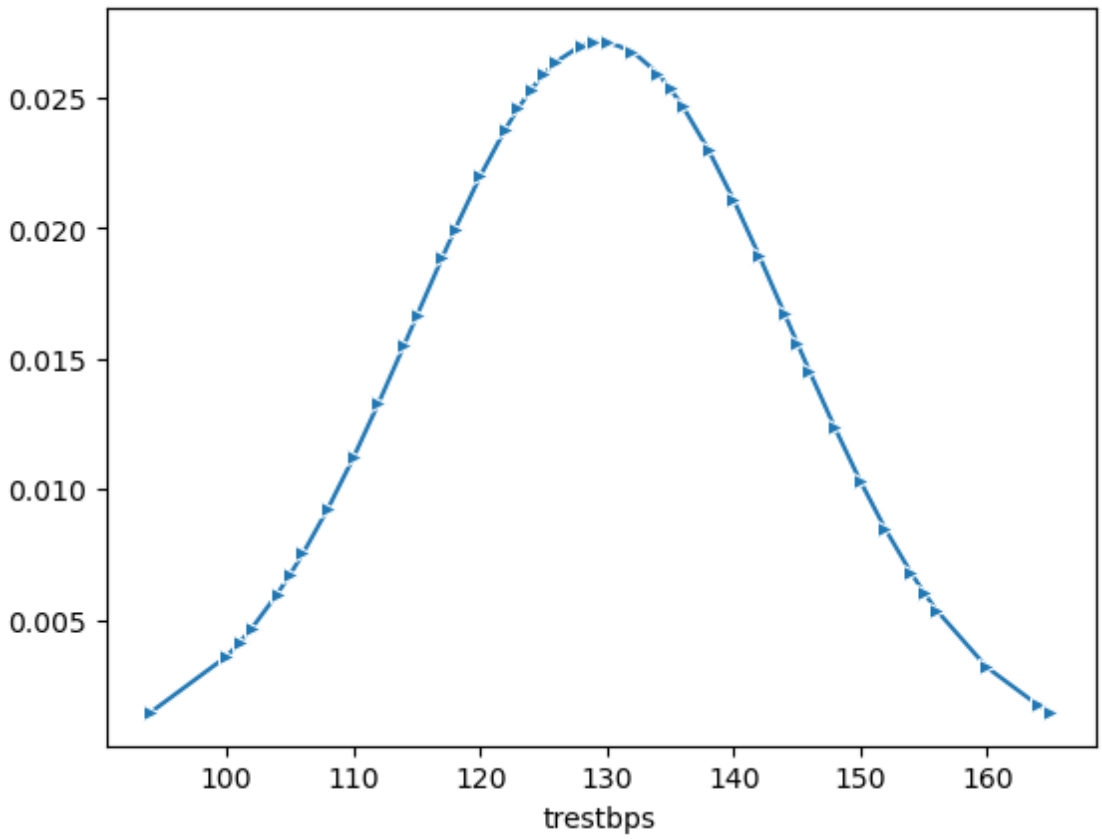
In [29]:

```
lineplot(heart.trestbps,pdf(heart.trestbps),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[29]:

```
<AxesSubplot:xlabel='trestbps'>
```



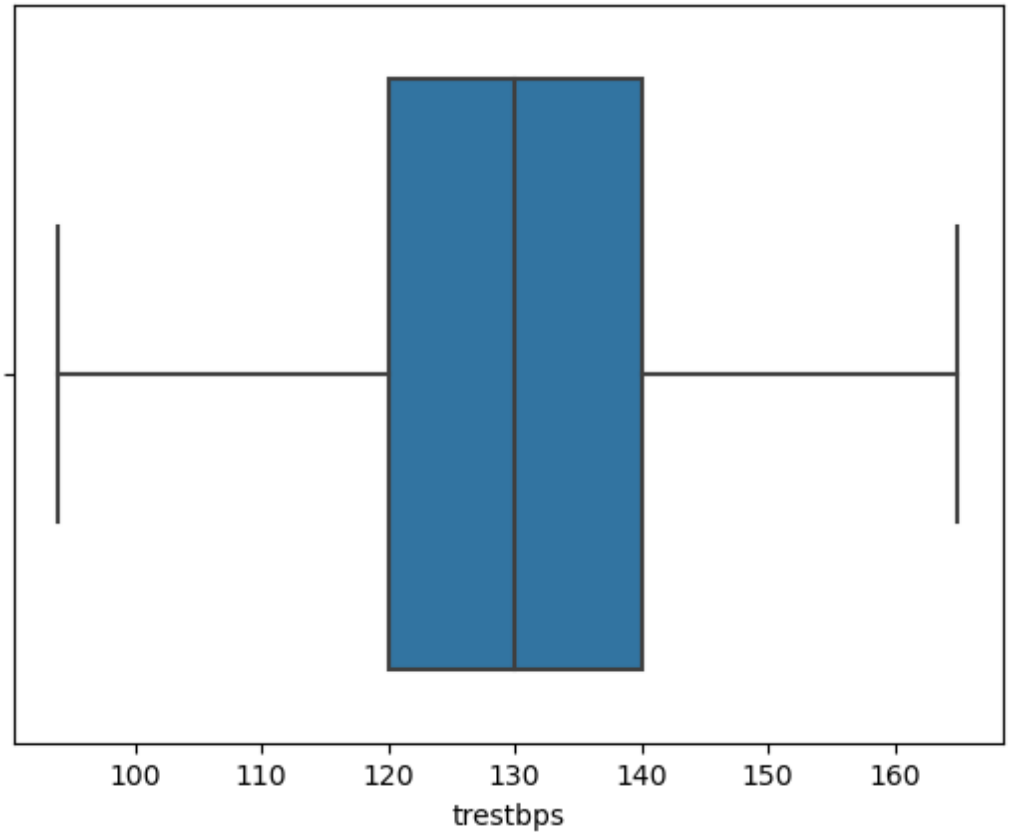
In [30]:

```
boxplot(heart.trestbps)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variable as a keyword arg: x. From version 0.12, t
he 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[30]:

```
<AxesSubplot:xlabel='trestbps'>
```



In [31]:

```
heart.chol
```

Out[31]:

```
0      233
1      250
2      204
3      236
4      354
      ...
298    241
299    264
300    193
301    131
302    236
Name: chol, Length: 290, dtype: int64
```

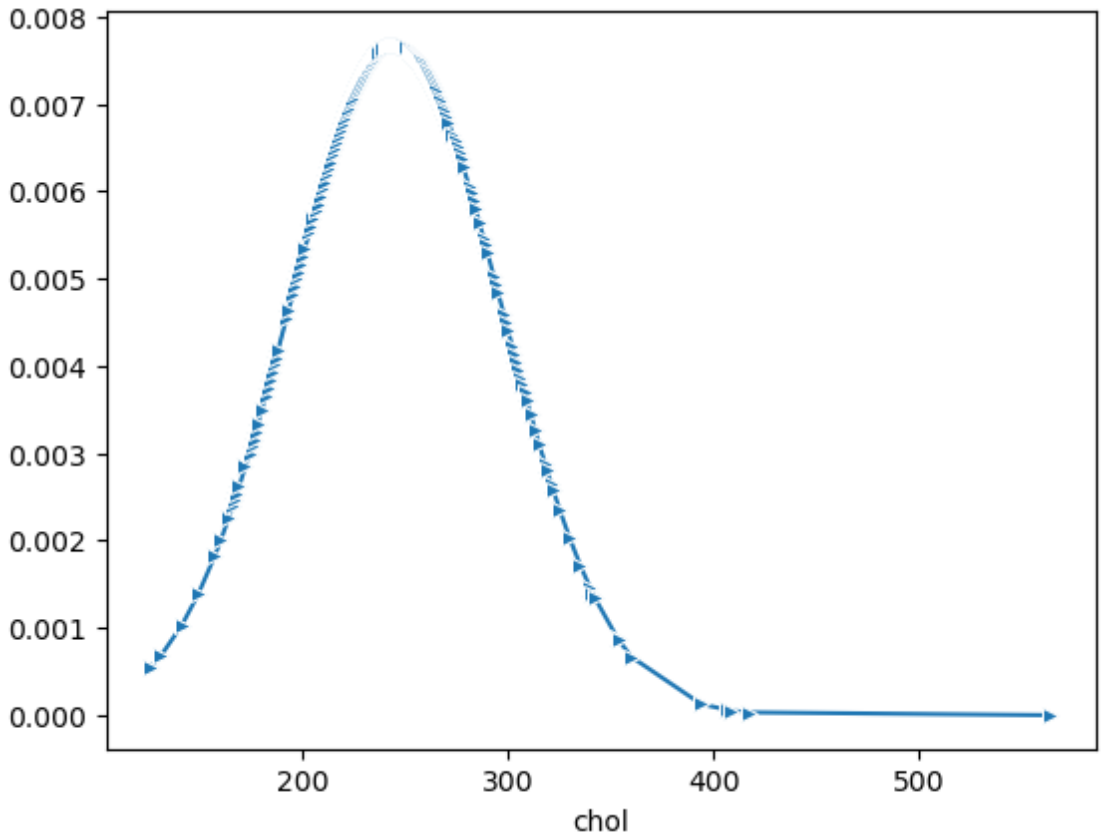
In [32]:

```
lineplot(heart.chol,pdf(heart.chol),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[32]:

```
<AxesSubplot:xlabel='chol'>
```



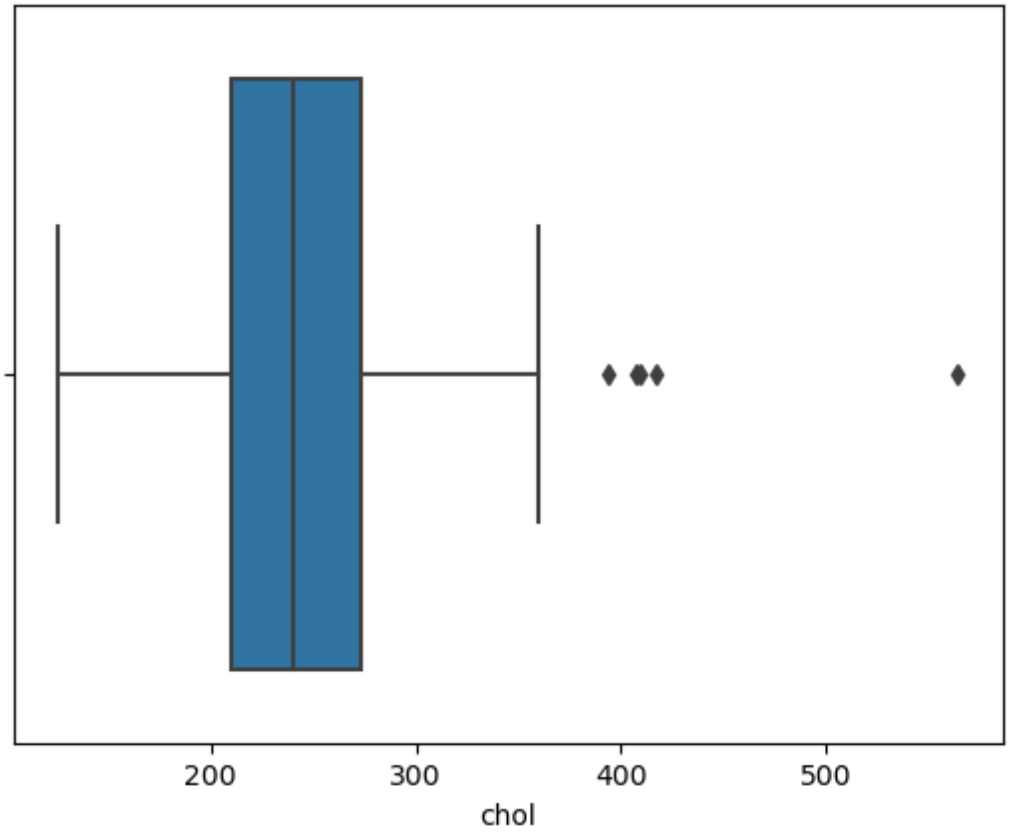
In [33]:

```
boxplot(heart.chol)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variable as a keyword arg: x. From version 0.12, t
he 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[33]:

```
<AxesSubplot:xlabel='chol'>
```



In [34]:

```
l=per(heart.chol)
```

In [35]:

```
heart=heart[heart.chol<l[1]]
```

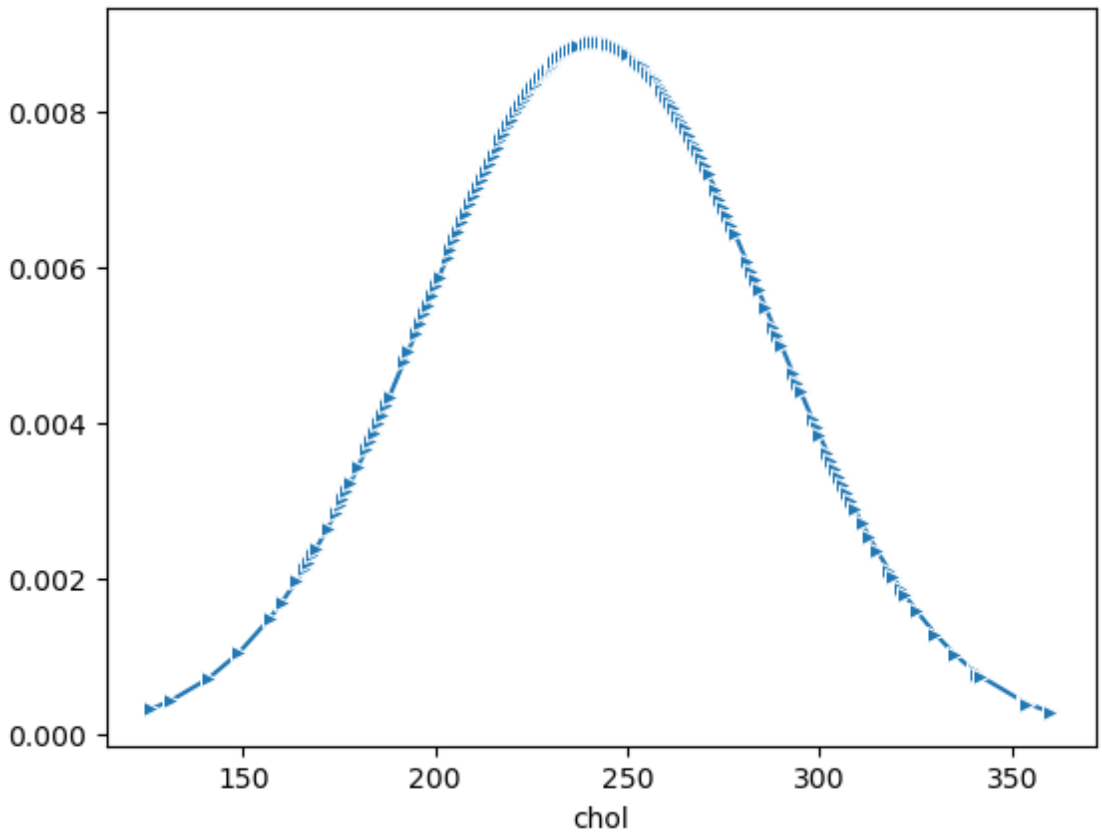
In [37]:

```
lineplot(heart.chol,pdf(heart.chol),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[37]:

```
<AxesSubplot:xlabel='chol'>
```



In [39]:

```
heart.thalach
```

Out[39]:

```
0      150
1      187
2      172
3      178
4      163
      ...
298    123
299    132
300    141
301    115
302    174
Name: thalach, Length: 285, dtype: int64
```

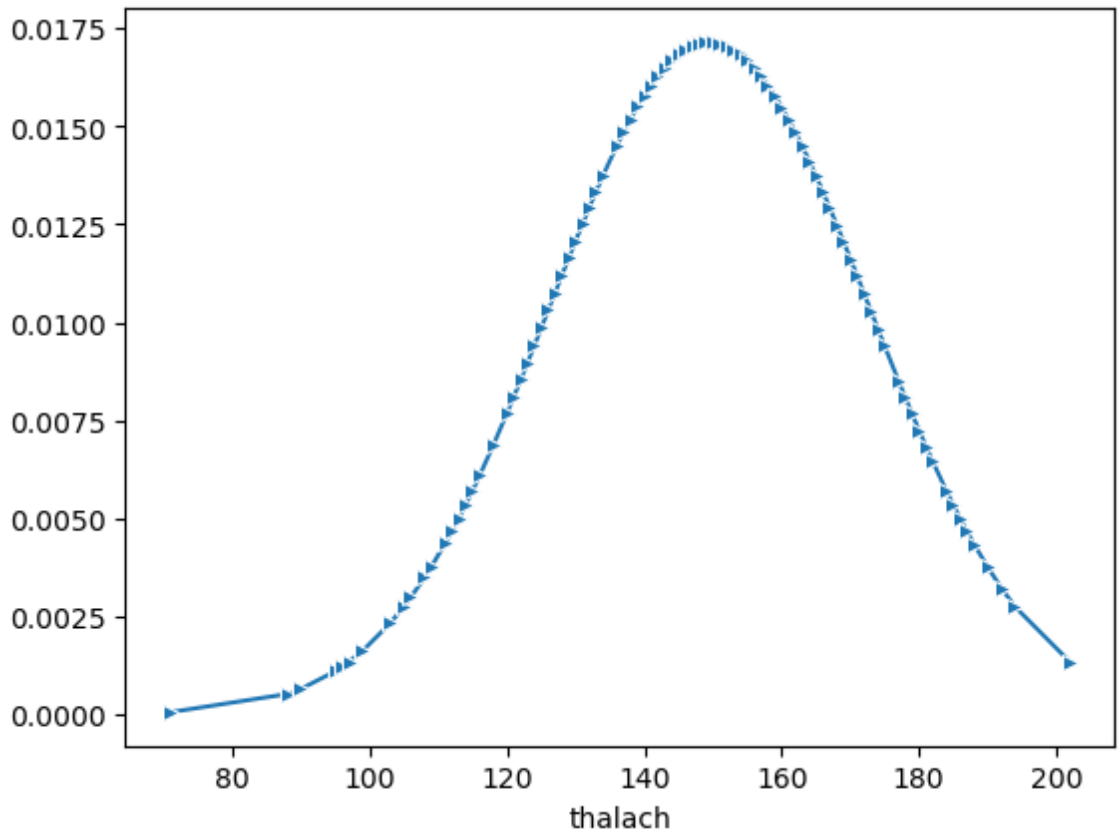
In [40]:

```
lineplot(heart.thalach,pdf(heart.thalach),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[40]:

```
<AxesSubplot:xlabel='thalach'>
```



In [42]:

```
l=per(heart.thalach)
l
```

Out[42]:

```
[78.0, 222.0]
```

In [43]:

```
heart=heart[heart.thalach<l[1]]
heart=heart[heart.thalach>l[0]]
```

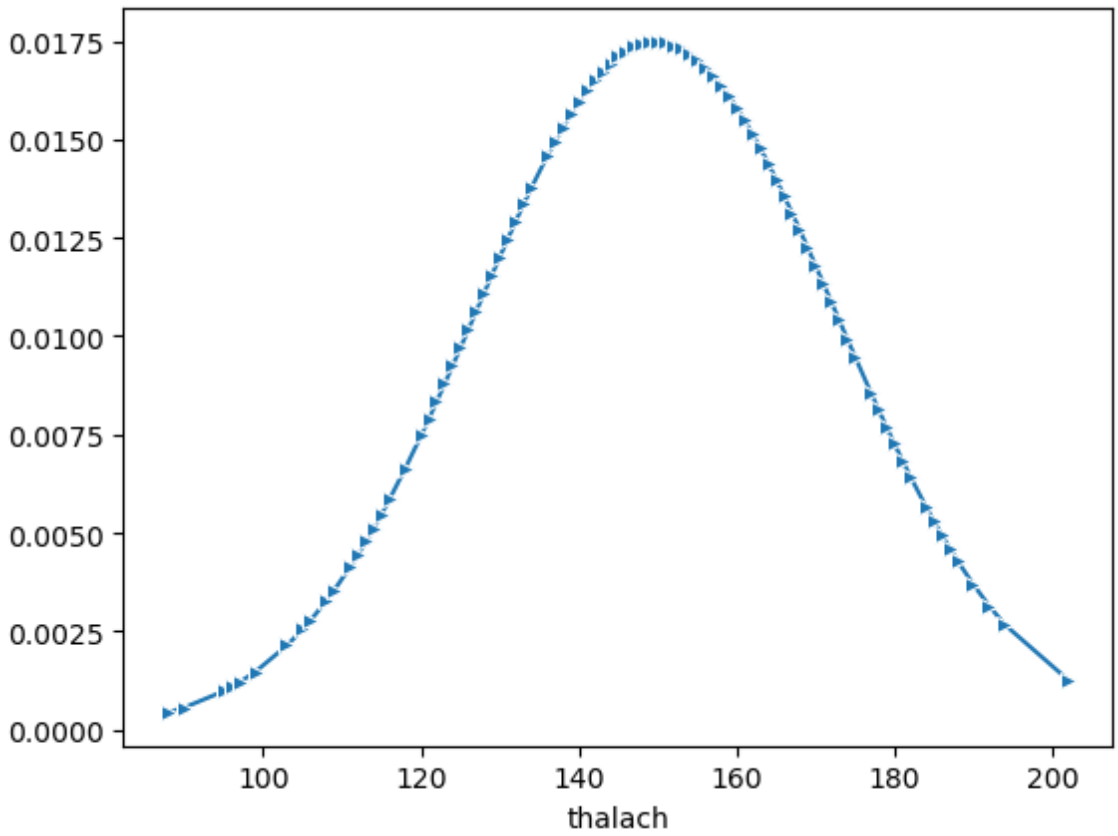
In [44]:

```
lineplot(heart.thalach,pdf(heart.thalach),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[44]:

```
<AxesSubplot:xlabel='thalach'>
```



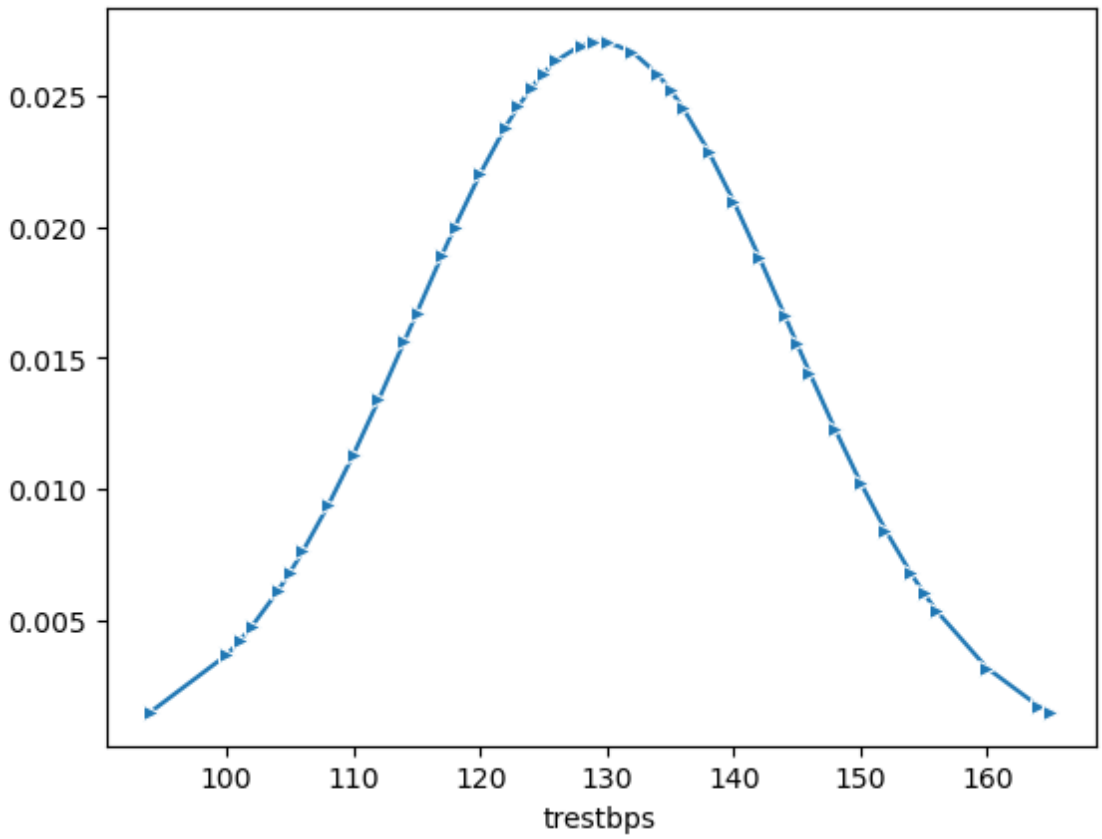
In [56]:

```
lineplot(heart.trestbps,pdf(heart.trestbps),marker='>')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[56]:

```
<AxesSubplot:xlabel='trestbps'>
```



In [38]:

```
heart.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 285 entries, 0 to 302
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       285 non-null    int64  
 1   sex       285 non-null    int64  
 2   cp        285 non-null    int64  
 3   trestbps  285 non-null    int64  
 4   chol      285 non-null    int64  
 5   fbs       285 non-null    int64  
 6   restecg   285 non-null    int64  
 7   thalach   285 non-null    int64  
 8   exang     285 non-null    int64  
 9   oldpeak   285 non-null    float64
 10  slope     285 non-null    int64  
 11  ca        285 non-null    int64  
 12  thal      285 non-null    int64  
 13  target    285 non-null    int64  
dtypes: float64(1), int64(13)
memory usage: 41.5 KB
```

In [49]:

```
heart.thal
```

Out[49]:

```
0      1
1      2
2      2
3      2
4      2
      ..
298    3
299    3
300    3
301    3
302    2
Name: thal, Length: 284, dtype: int64
```

In [52]:

```
s=StandardScaler()
heart.age=s.fit_transform(array(heart.age).reshape(-1,1))
```

In [53]:

```
heart.chol=s.fit_transform(array(heart.chol).reshape(-1,1))
```

In [54]:

```
heart.thalach=s.fit_transform(array(heart.thalach).reshape(-1,1))
```

In [57]:

```
heart.trestbps=s.fit_transform(array(heart.trestbps).reshape(-1,1))
```

In [58]:

```
heart
```

Out[58]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca
0	0.991854	1	3	1.053602	-0.196725	1	0	0.010800	0	2.3	0	
1	-1.855676	1	2	0.036068	0.181827	0	1	1.632014	0	3.5	0	
2	-1.417595	0	1	0.036068	-0.842489	0	0	0.974765	0	1.4	2	
3	0.225211	1	1	-0.642289	-0.129921	0	1	1.237665	0	0.8	2	
4	0.334731	0	0	-0.642289	2.497672	0	1	0.580416	1	0.6	2	
...	...	...	...	...	...	...	...	...	...	...	...	..
298	0.334731	0	0	0.714424	-0.018583	0	1	-1.172249	1	0.2	1	
299	-0.979513	1	3	-1.320645	0.493575	0	1	-0.777899	0	1.2	1	
300	1.539455	1	0	0.985766	-1.087434	1	1	-0.383550	0	3.4	1	
301	0.334731	1	0	0.036068	-2.468034	0	1	-1.522781	1	1.2	1	
302	0.334731	0	1	0.036068	-0.129921	0	0	1.062398	0	0.0	1	

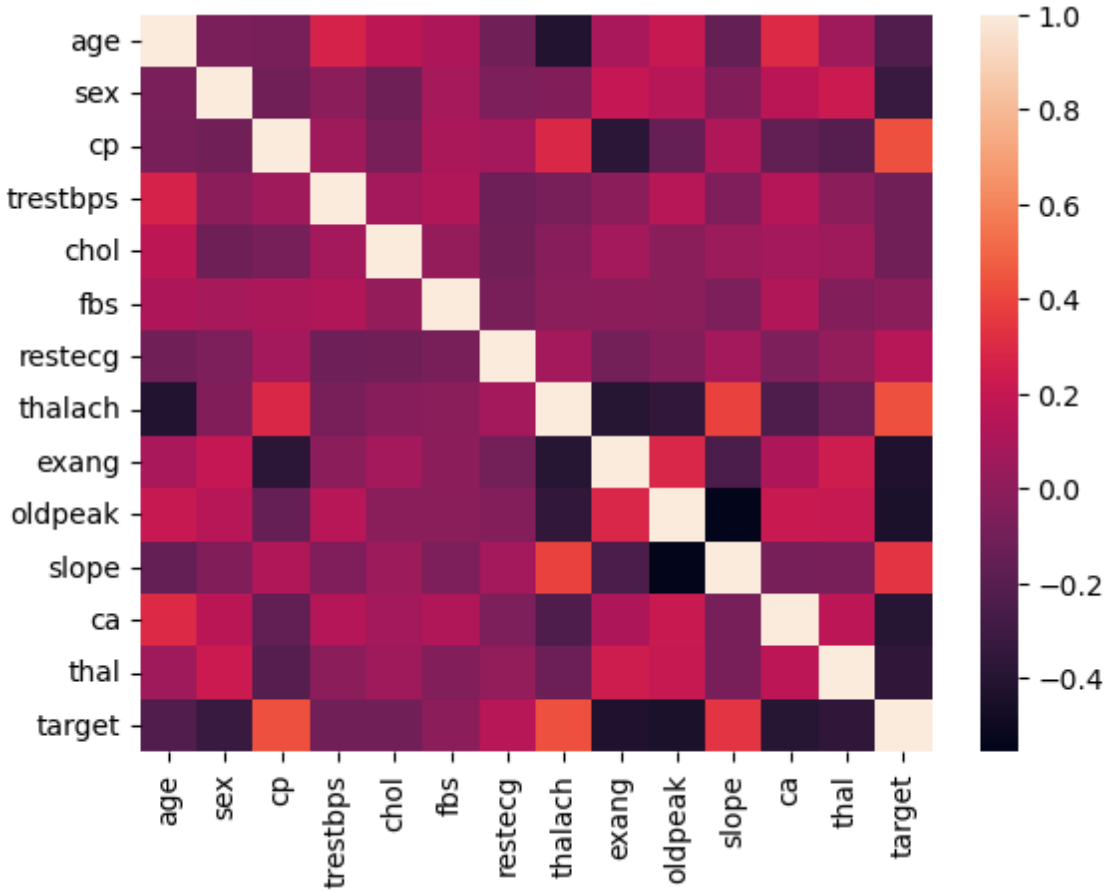
284 rows × 14 columns

In [59]:

```
heatmap(heart.corr())
```

Out[59]:

```
<AxesSubplot:>
```

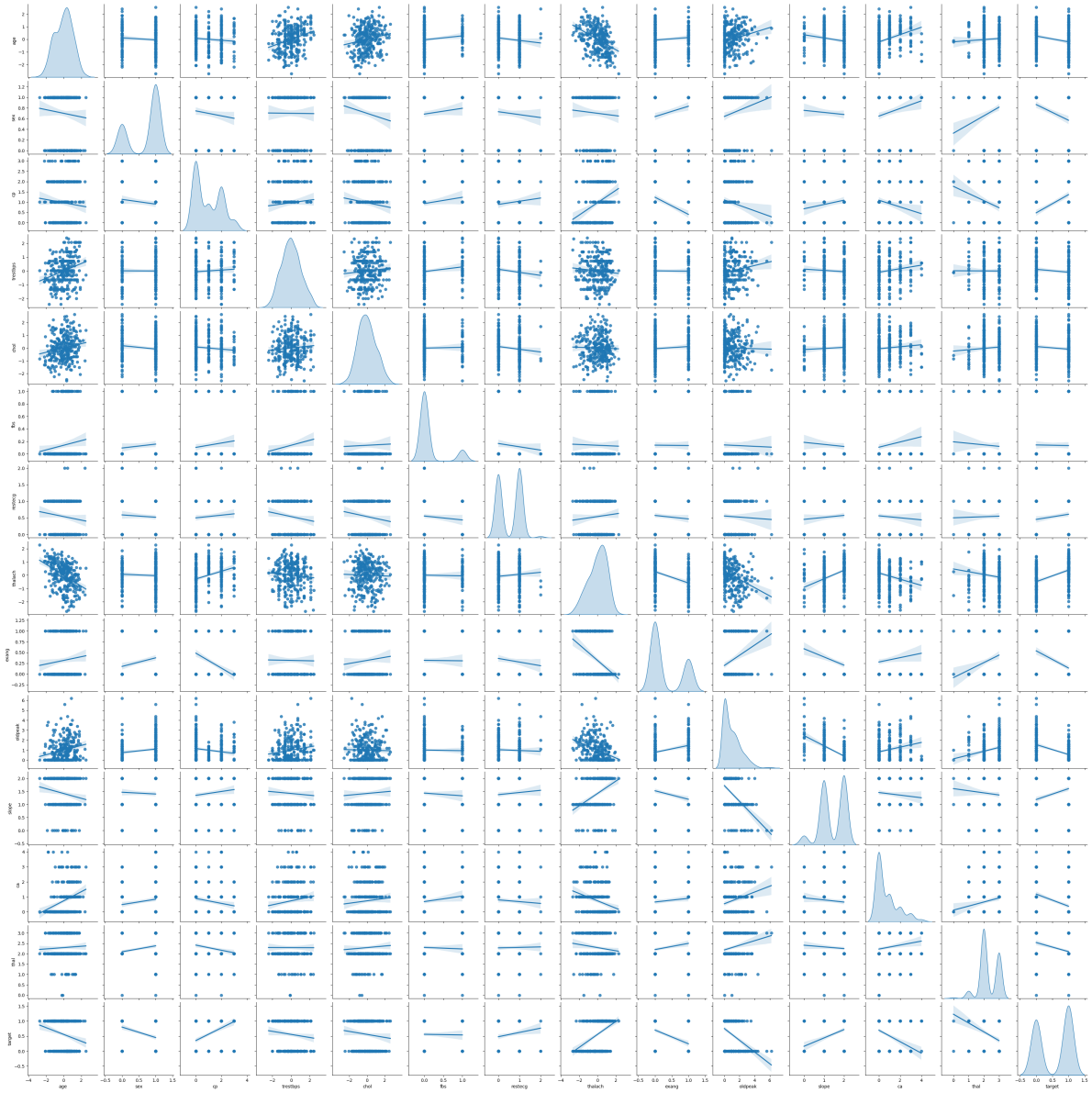


In [149]:

```
pairplot(heart,diag_kind='kde',kind='reg')
```

Out[149]:

```
<seaborn.axisgrid.PairGrid at 0x15f3e1383d0>
```



In [73]:

```
models=[LogisticRegression(),RandomForestClassifier(),DecisionTreeClassifier(),SVC()]
ran={'n_estimators':[60,70,80,90,100]}
dec={'criterion':["gini", "entropy"]}
sv={'kernel':['linear', 'poly', 'rbf', 'sigmoid']}
```

In [65]:

```
m1=cross_val_score(models[0],heart.drop('target',axis=1),heart['target'],cv=5)
```

In [67]:

```
mean(m1)
```

Out[67]:

```
0.8270676691729323
```

In [69]:

```
m2=GridSearchCV(models[1],ran,cv=5).fit(heart.drop('target',axis=1),heart['target'])
```

In [74]:

```
m3=GridSearchCV(models[2],dec,cv=5).fit(heart.drop('target',axis=1),heart['target'])
```

In [76]:

```
m4=GridSearchCV(models[3],sv,cv=5).fit(heart.drop('target',axis=1),heart['target'])
```

In [77]:

```
DataFrame(m2.cv_results_)
```

Out[77]:

nators	params	split0_test_score	split1_test_score	split2_test_score	split3_test_score	split
60	{'n_estimators': 60}	0.789474	0.842105	0.859649	0.842105	
70	{'n_estimators': 70}	0.824561	0.877193	0.824561	0.859649	
80	{'n_estimators': 80}	0.824561	0.877193	0.824561	0.842105	
90	{'n_estimators': 90}	0.842105	0.877193	0.842105	0.842105	
100	{'n_estimators': 100}	0.824561	0.894737	0.859649	0.824561	

In [78]:

```
DataFrame(m3.cv_results_)
```

Out[78]:

re_time	param_criterion	params	split0_test_score	split1_test_score	split2_test_score	split3_te
.003924	gini	{'criterion': 'gini'}	0.701754	0.789474	0.789474	
.003920	entropy	{'criterion': 'entropy'}	0.736842	0.807018	0.789474	

In [79]:

```
DataFrame(m4.cv_results_)
```

Out[79]:

ıram_kernel	params	split0_test_score	split1_test_score	split2_test_score	split3_test_score	split
linear	{'kernel': 'linear'}	0.754386	0.859649	0.859649	0.894737	
poly	{'kernel': 'poly'}	0.754386	0.842105	0.894737	0.754386	
rbf	{'kernel': 'rbf'}	0.807018	0.859649	0.859649	0.859649	
sigmoid	{'kernel': 'sigmoid'}	0.771930	0.859649	0.842105	0.894737	

In [81]:

```
m5=cross_val_score(ExtraTreesClassifier(),heart.drop('target',axis=1),heart['target'],cv=5)
```

In [83]:

```
mean(m5)
```

Out[83]:

```
0.8236842105263158
```

In [84]:

```
x_train,x_test,y_train,y_test=train_test_split(heart.drop('target',axis=1),heart['target'],
```

In [85]:

```
f_model=LogisticRegression().fit(x_train,y_train)
```

In [89]:

```
y_pred=f_model.predict(x_test)
```

In [91]:

```
confusion_matrix(y_test,y_pred)
```

Out[91]:

```
array([[22,  9],
       [ 2, 24]], dtype=int64)
```

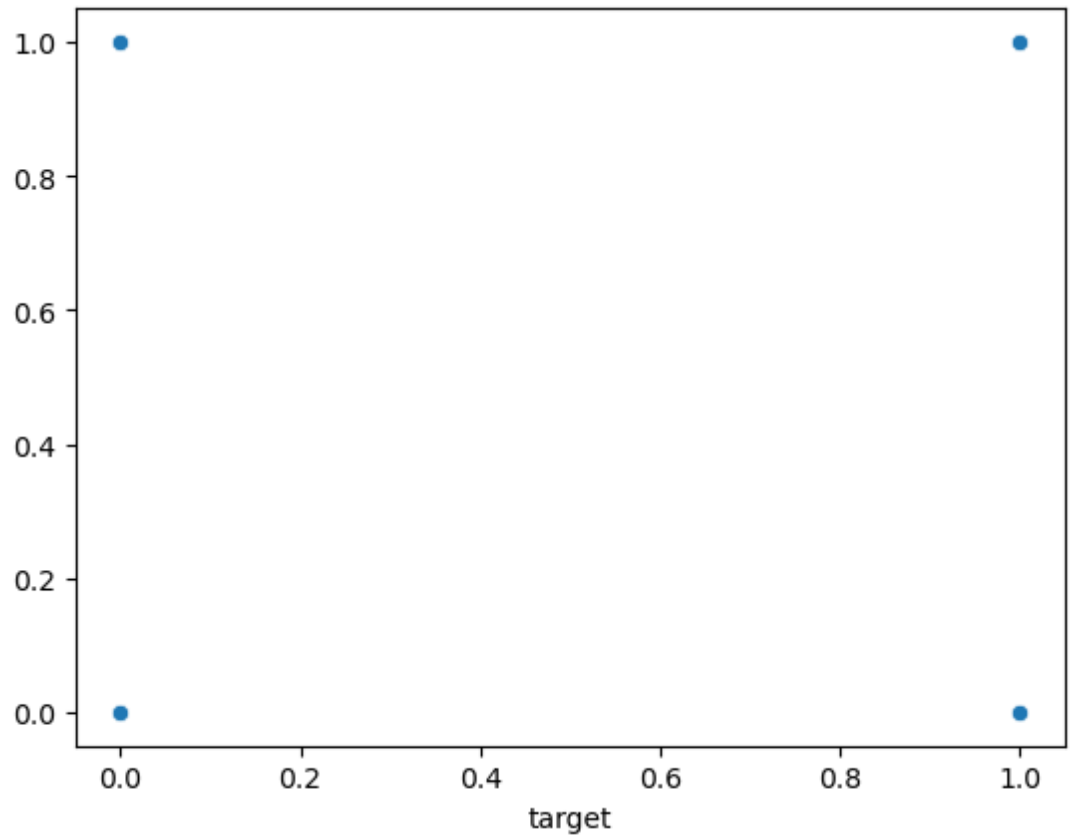
In [92]:

```
scatterplot(y_test,y_pred)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[92]:

```
<AxesSubplot:xlabel='target'>
```



In [ ]:

```

```

Diabetics

In [86]:

```
dia=read_csv('diabetes.csv')
```

In [87]:

```
dia
```

Out[87]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunctic
0	6	148	72	35	0	33.6	0.6
1	1	85	66	29	0	26.6	0.3
2	8	183	64	0	0	23.3	0.6
3	1	89	66	23	94	28.1	0.1
4	0	137	40	35	168	43.1	2.2
...	...	...	...	...	...	...	
763	10	101	76	48	180	32.9	0.1
764	2	122	70	27	0	36.8	0.3
765	5	121	72	23	112	26.2	0.2
766	1	126	60	0	0	30.1	0.3
767	1	93	70	31	0	30.4	0.3

768 rows × 9 columns

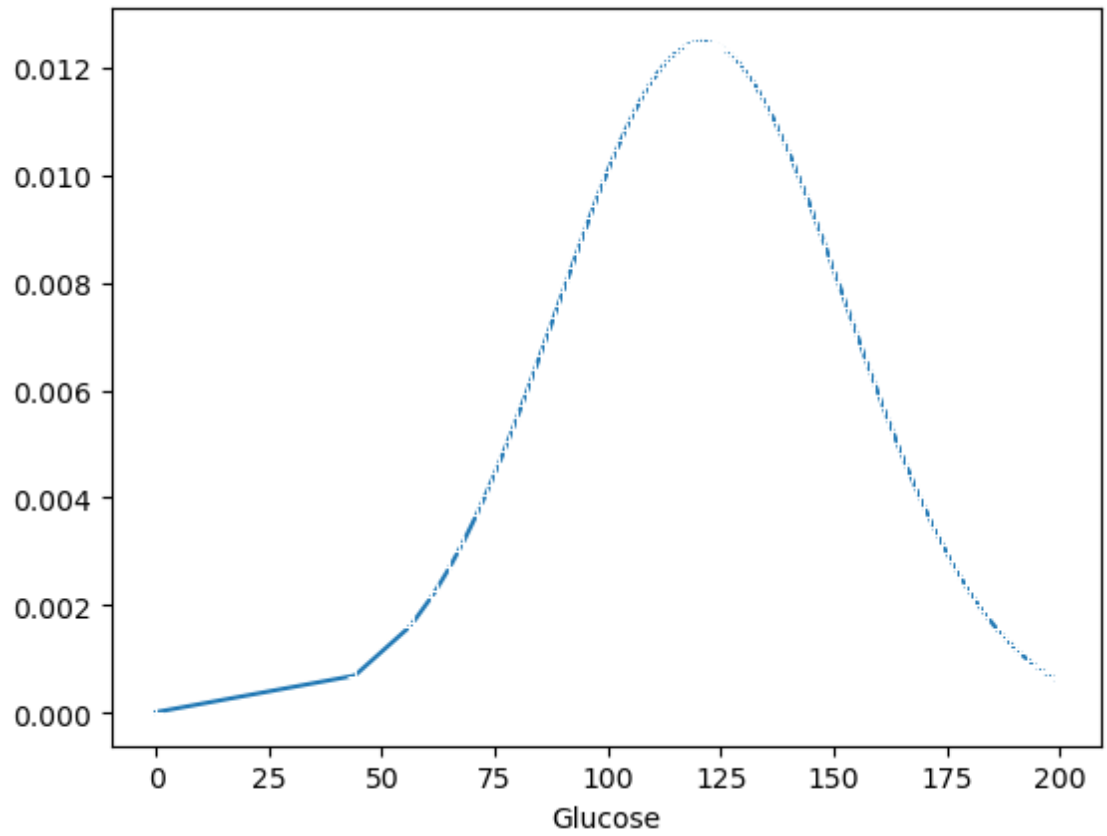
In [88]:

```
lineplot(dia.Glucose,pdf(dia.Glucose),marker='+')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[88]:

```
<AxesSubplot:xlabel='Glucose'>
```



In [93]:

```
l=per(dia.Glucose)
l
```

Out[93]:

```
[37.125, 202.125]
```

In [95]:

```
dia=dia[dia.Glucose>l[0]]
dia=dia[dia.Glucose<l[1]]
```

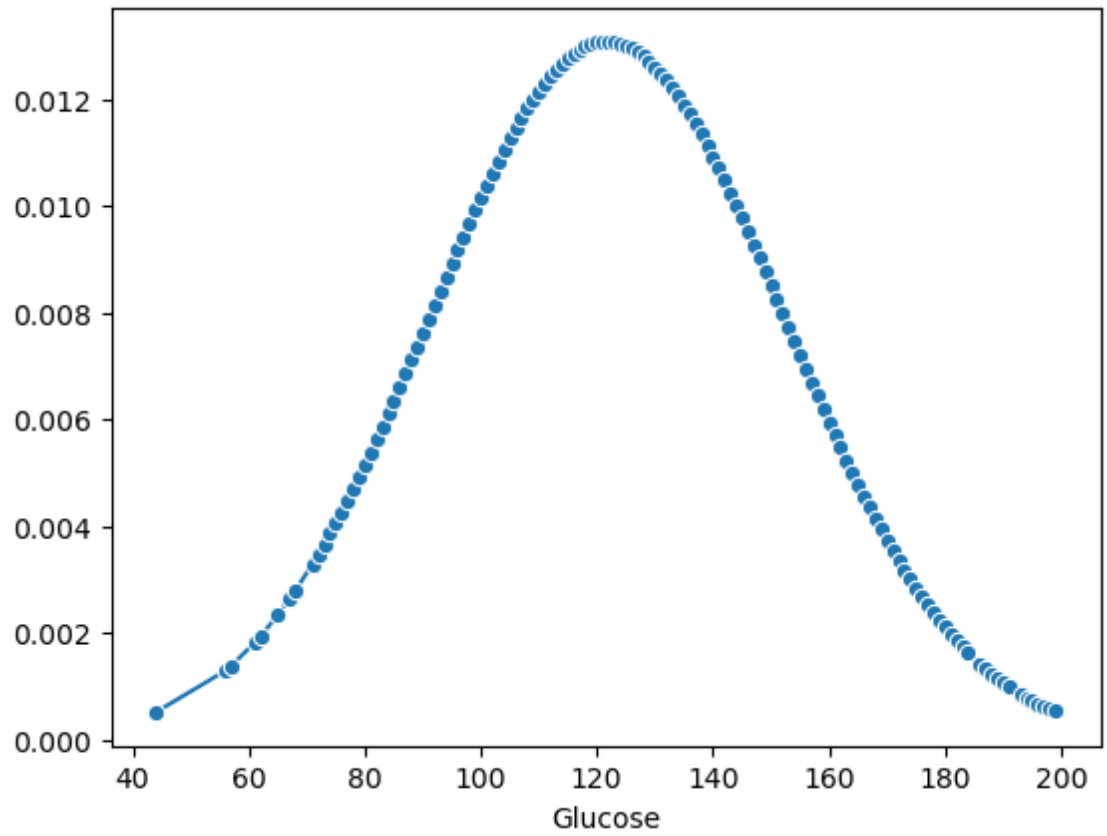
In [97]:

```
lineplot(dia.Glucose,pdf(dia.Glucose),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[97]:

```
<AxesSubplot:xlabel='Glucose'>
```



In [98]:

```
l=per(dia.BloodPressure)
l
```

Out[98]:

```
[35.0, 107.0]
```

In [99]:

```
dia=dia[dia.BloodPressure>l[0]]
dia=dia[dia.BloodPressure<l[1]]
```

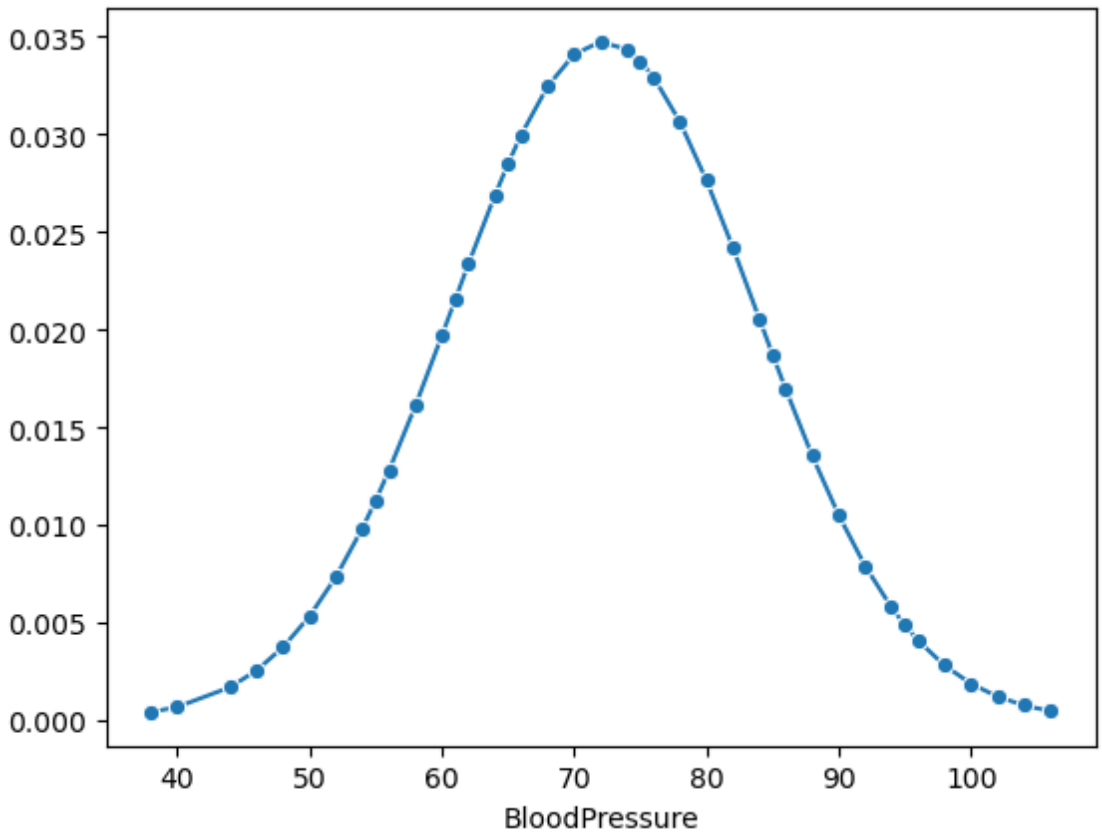
In [105]:

```
lineplot(dia.BloodPressure,pdf(dia.BloodPressure),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[105]:

```
<AxesSubplot:xlabel='BloodPressure'>
```



In [107]:

```
l=per(dia.SkinThickness)
```

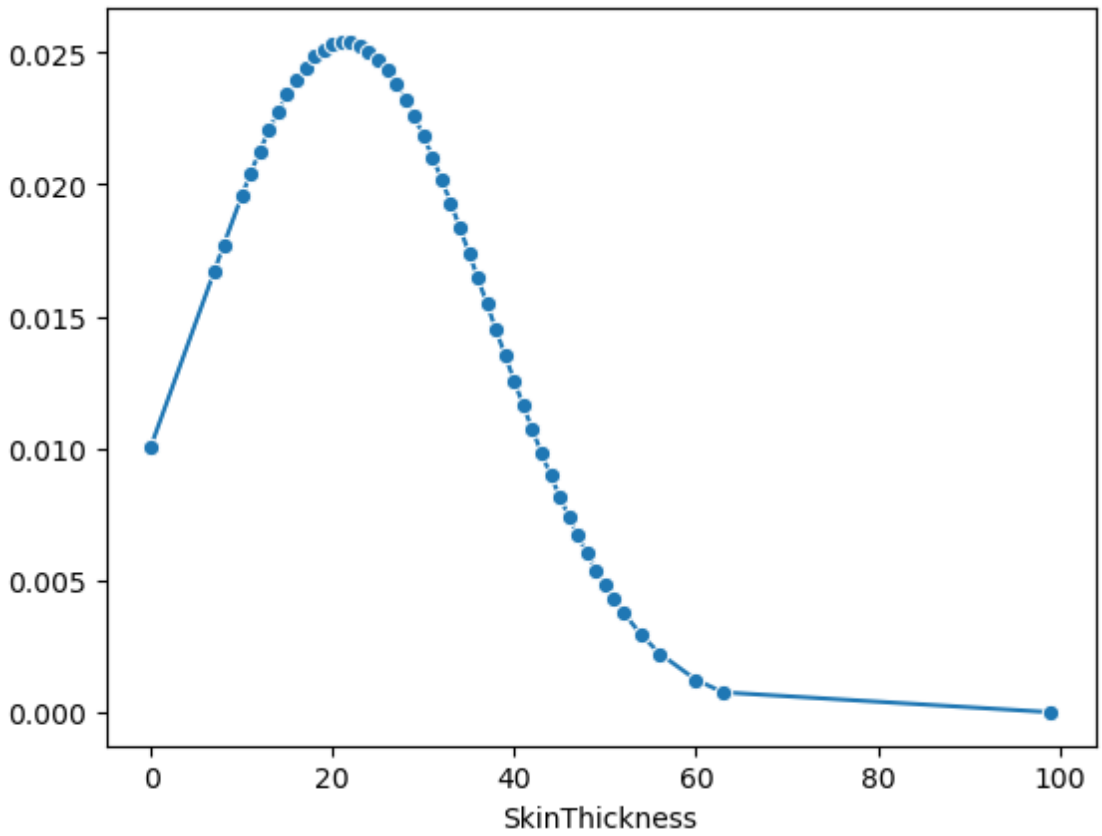
In [108]:

```
lineplot(dia.SkinThickness,pdf(dia.SkinThickness),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[108]:

```
<AxesSubplot:xlabel='SkinThickness'>
```



In [109]:

```
dia=dia[dia.SkinThickness>l[0]]
dia=dia[dia.SkinThickness<l[1]]
```

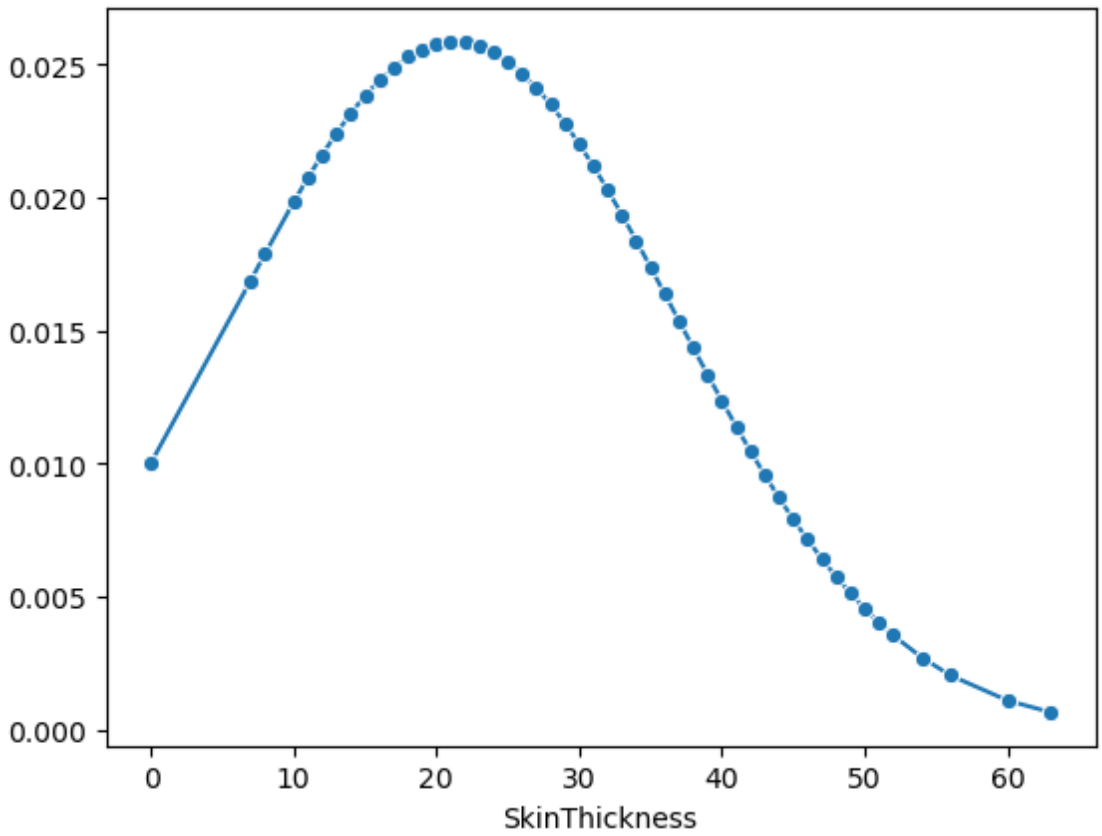
In [110]:

```
lineplot(dia.SkinThickness,pdf(dia.SkinThickness),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[110]:

```
<AxesSubplot:xlabel='SkinThickness'>
```



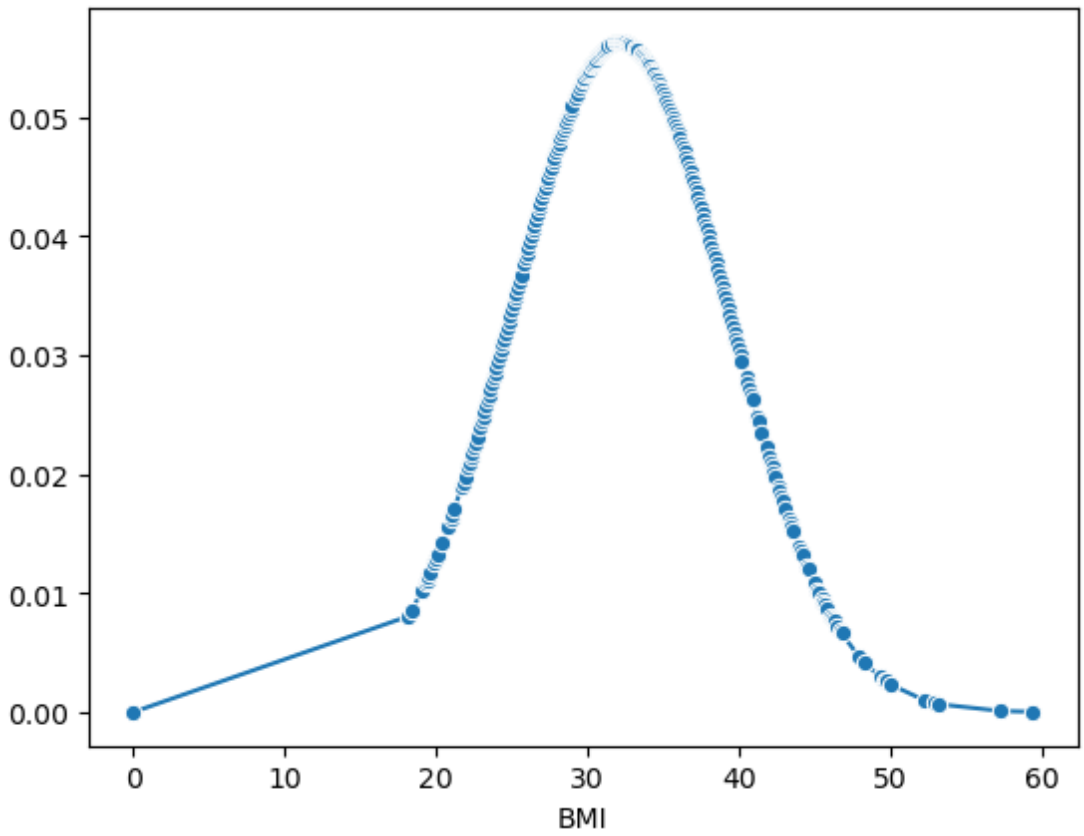
In [112]:

```
lineplot(dia.BMI,pdf(dia.BMI),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[112]:

```
<AxesSubplot:xlabel='BMI'>
```



In [113]:

```
dia=dia[dia.BMI>l[0]]
dia=dia[dia.BMI<l[1]]
```

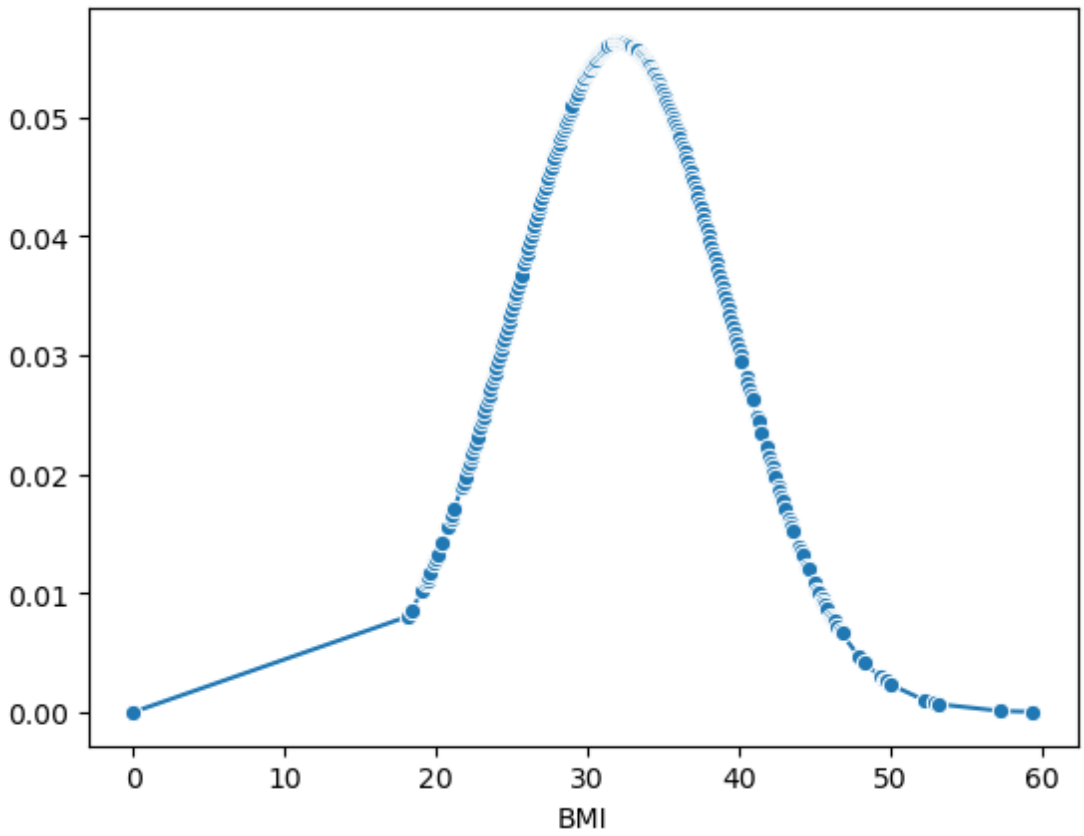
In [114]:

```
lineplot(dia.BMI,pdf(dia.BMI),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[114]:

```
<AxesSubplot:xlabel='BMI'>
```



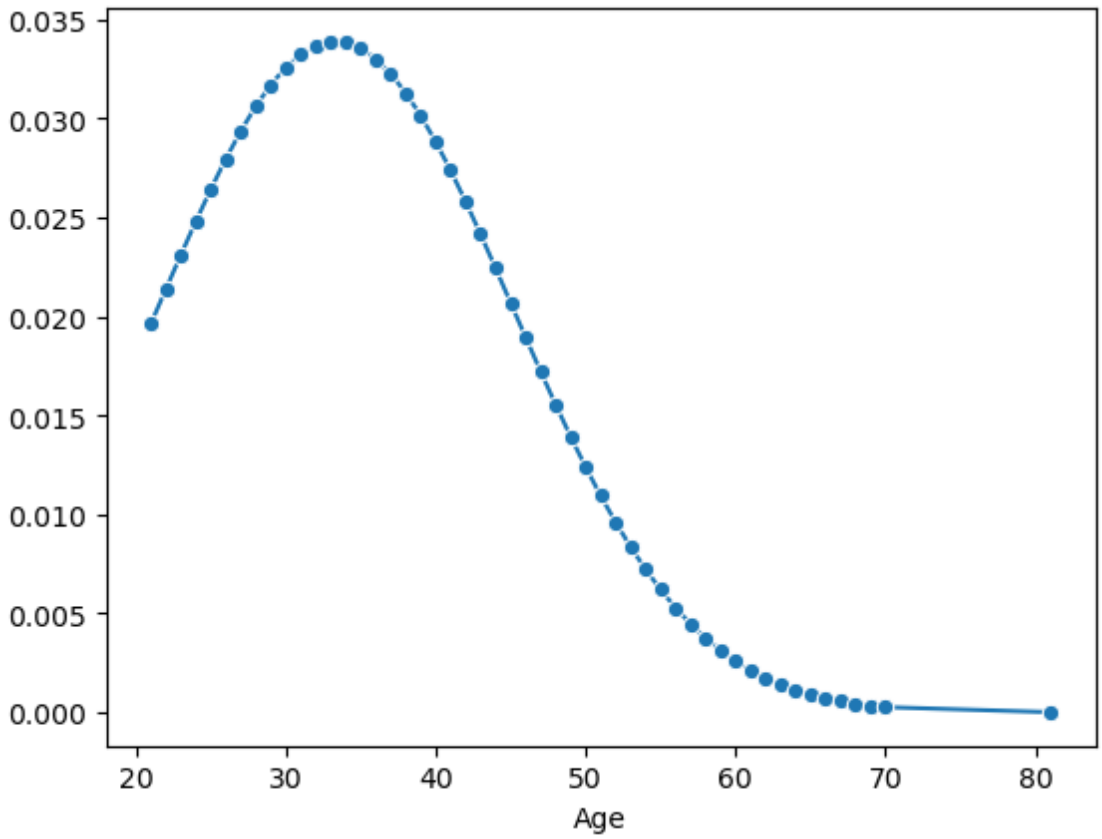
In [116]:

```
lineplot(dia.Age,pdf(dia.Age),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[116]:

```
<AxesSubplot:xlabel='Age'>
```



In [117]:

```
l=per(dia.Age)
```

In [118]:

```
dia=dia[dia.Age>l[0]]
dia=dia[dia.Age<l[1]]
```

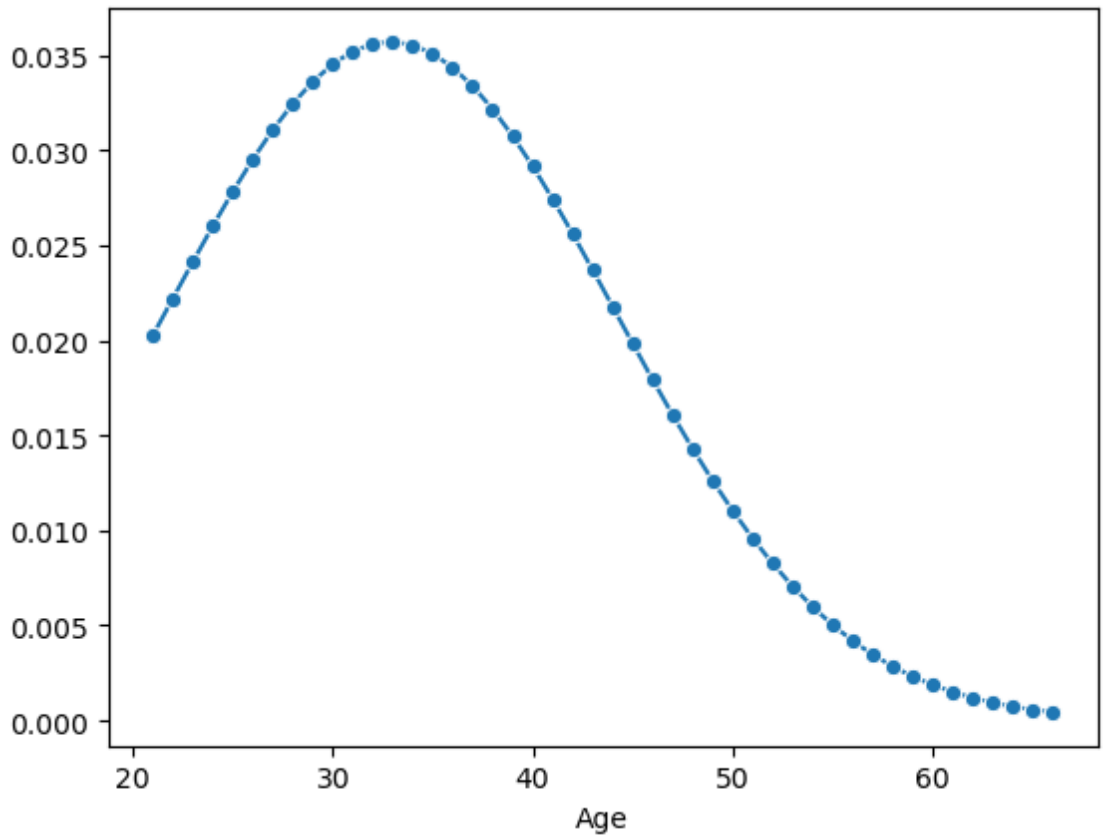
In [119]:

```
lineplot(dia.Age,pdf(dia.Age),marker='o')
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[119]:

```
<AxesSubplot:xlabel='Age'>
```



In [120]:

```
dia.Age=s.fit_transform(array(dia.Age).reshape(-1,1))
```

In [121]:

```
dia.Glucose=s.fit_transform(array(dia.Glucose).reshape(-1,1))
```

In [122]:

```
dia.SkinThickness=s.fit_transform(array(dia.SkinThickness).reshape(-1,1))
```

In [123]:

```
dia.Insulin=s.fit_transform(array(dia.Insulin).reshape(-1,1))
dia.BMI=s.fit_transform(array(dia.BMI).reshape(-1,1))
```

In [125]:

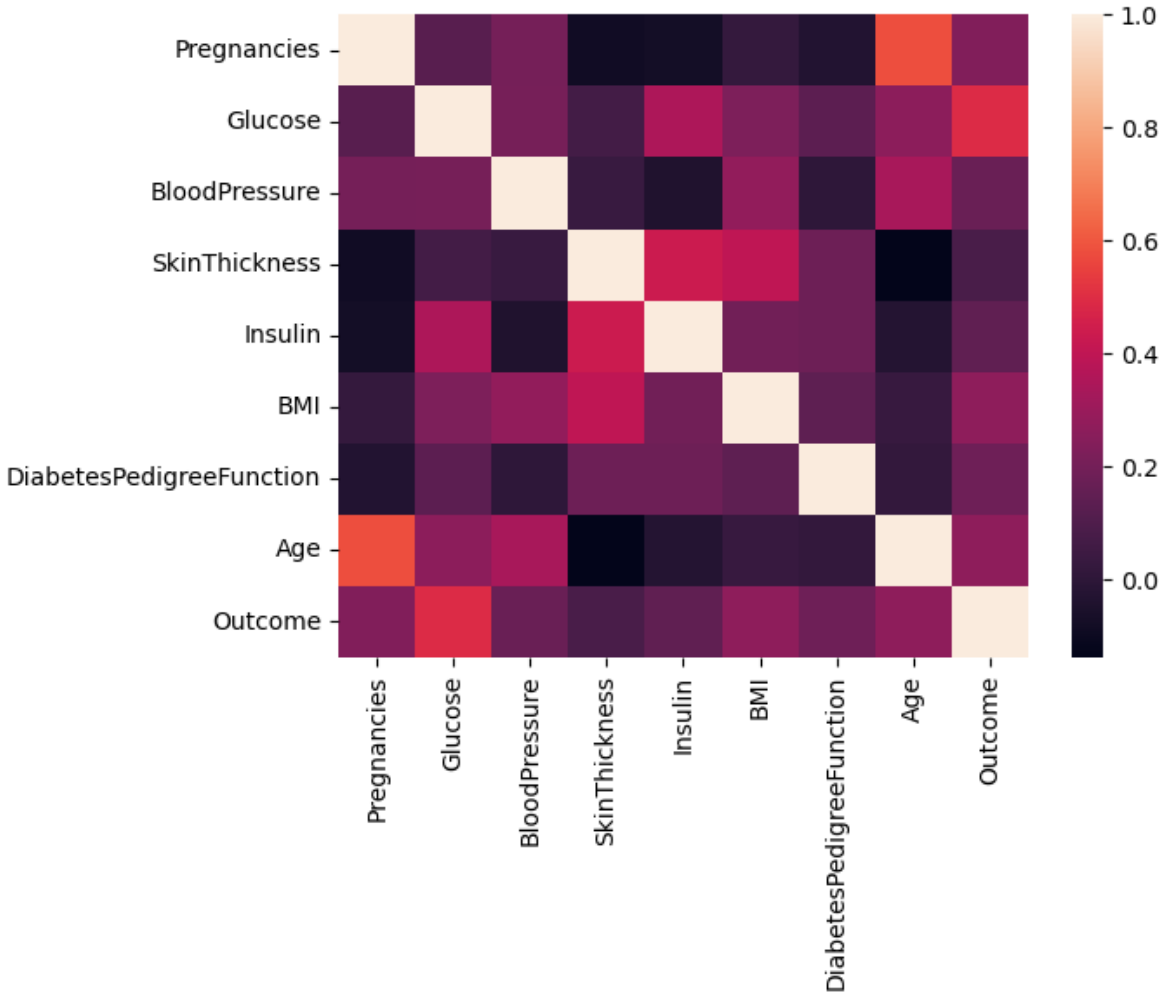
```
dia.BloodPressure=s.fit_transform(array(dia.BloodPressure).reshape(-1,1))
```

In [150]:

```
heatmap(dia.corr())
```

Out[150]:

<AxesSubplot:>



In [136]:

```
md1=cross_val_score(models[0],dia.drop('Outcome',axis=1),dia['Outcome'],cv=5)
```

In [137]:

```
mean(md1)
```

Out[137]:

0.7715512935770652

In [129]:

```
md2=GridSearchCV(models[1],ran,cv=5).fit(dia.drop('Outcome',axis=1),dia['Outcome'])
```

In [130]:

```
md3=GridSearchCV(models[2],dec,cv=5).fit(dia.drop('Outcome',axis=1),dia['Outcome'])
```

In [131]:

```
md4=GridSearchCV(models[3],sv,cv=5).fit(dia.drop('Outcome',axis=1),dia['Outcome'])
```

In [133]:

```
md5=cross_val_score(ExtraTreesClassifier(),dia.drop('Outcome',axis=1),dia['Outcome'],cv=5)
```

In [134]:

```
mean(md5)
```

Out[134]:

```
0.7701028868244931
```

In [138]:

```
DataFrame(md2.cv_results_)
```

Out[138]:

ime	param_n_estimators	params	split0_test_score	split1_test_score	split2_test_score	spli
835	60	{'n_estimators': 60}	0.739437	0.753521	0.753521	
547	70	{'n_estimators': 70}	0.746479	0.746479	0.767606	
235	80	{'n_estimators': 80}	0.753521	0.732394	0.774648	
687	90	{'n_estimators': 90}	0.767606	0.732394	0.732394	
248	100	{'n_estimators': 100}	0.746479	0.725352	0.788732	

In [139]:

```
DataFrame(md3.cv_results_)
```

Out[139]:

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	param_criterion	params	spli
0	0.010159	0.003025	0.004206	0.003603	gini	{'criterion': 'gini'}	
1	0.010100	0.003202	0.004404	0.003628	entropy	{'criterion': 'entropy'}	

In [140]:

```
DataFrame(md4.cv_results_)
```

Out[140]:

ıram_kernel	params	split0_test_score	split1_test_score	split2_test_score	split3_test_score	split
linear	{'kernel': 'linear'}	0.774648	0.725352	0.760563	0.795775	
poly	{'kernel': 'poly'}	0.704225	0.732394	0.690141	0.739437	
rbf	{'kernel': 'rbf'}	0.774648	0.711268	0.753521	0.788732	
sigmoid	{'kernel': 'sigmoid'}	0.711268	0.563380	0.633803	0.697183	

In [141]:

```
x_train1,x_test1,y_train1,y_test1=train_test_split(dia.drop('Outcome',axis=1),dia['Outcome'
```

In [142]:

```
f_model1=LogisticRegression().fit(x_train1,y_train1)
```

In [143]:

```
y_pred1=f_model1.predict(x_test1)
```

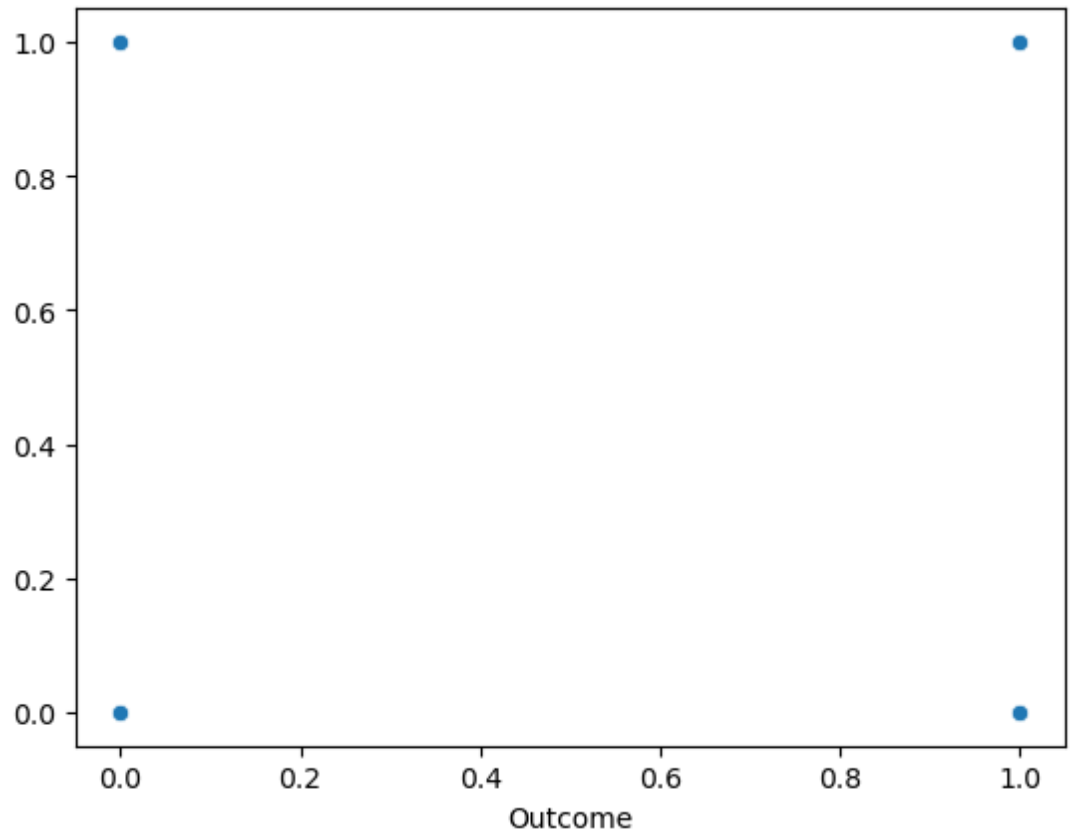
In [144]:

```
scatterplot(y_test1,y_pred1)
```

```
C:\Users\boddu\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variables as keyword args: x, y. From version 0.1
2, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretatio
n.
  warnings.warn(
```

Out[144]:

```
<AxesSubplot:xlabel='Outcome'>
```



In [145]:

```
confusion_matrix(y_test1,y_pred1)
```

Out[145]:

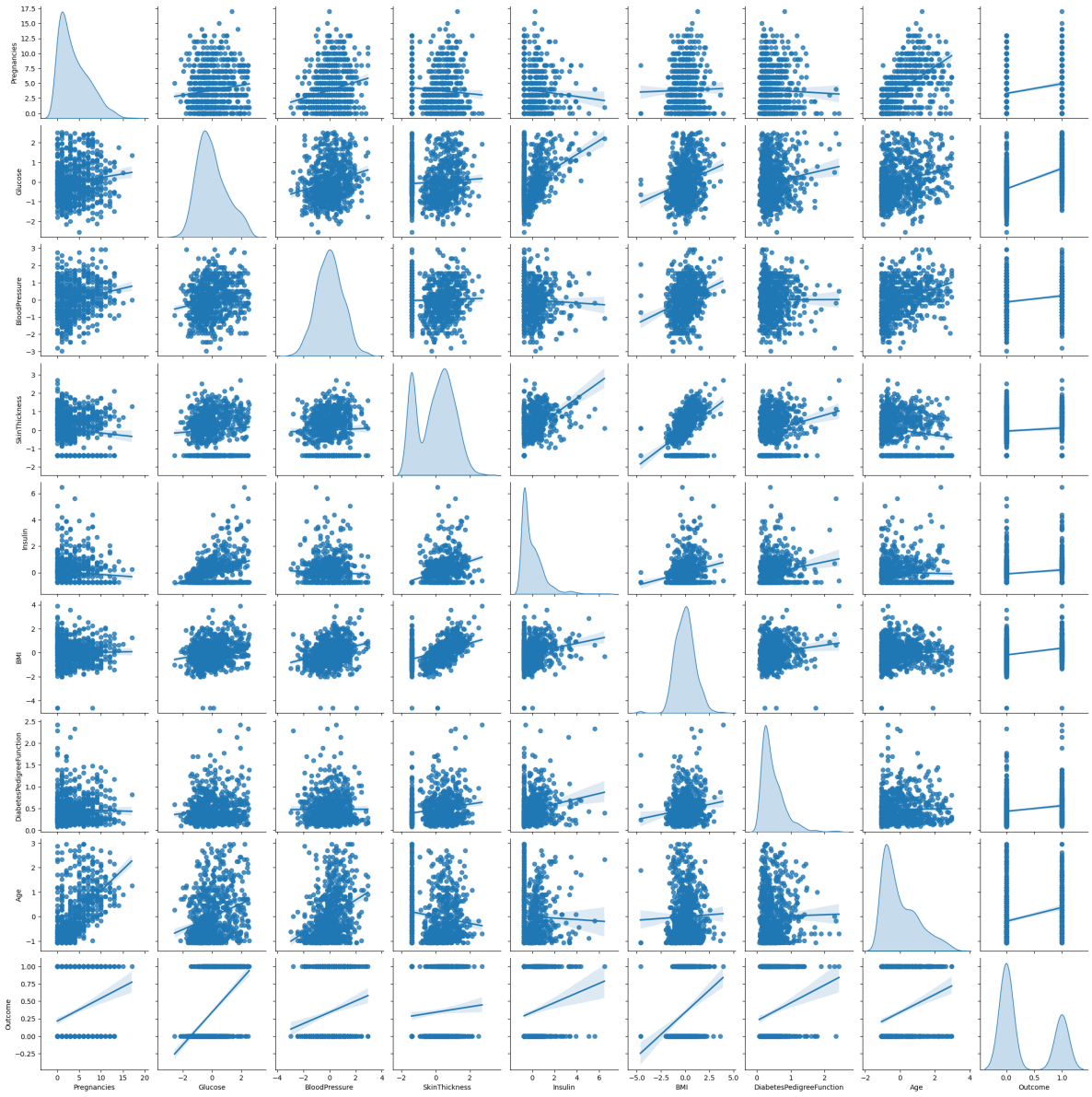
```
array([[76, 12],
       [19, 35]], dtype=int64)
```

In [146]:

```
pairplot(dia,diag_kind='kde',kind='reg')
```

Out[146]:

```
<seaborn.axisgrid.PairGrid at 0x15f38438730>
```

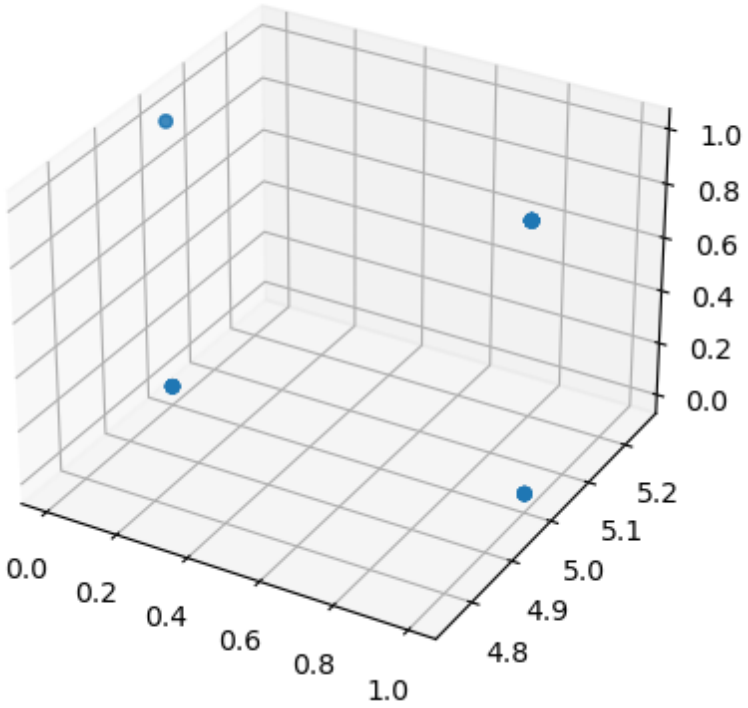


In [147]:

```
ax=plt.axes(projection='3d')
ax.scatter3D(y_pred,[5],y_test)
```

Out[147]:

```
<mpl_toolkits.mplot3d.art3d.Path3DCollection at 0x15f3cde0fd0>
```



In [148]:

```
ax=plt.axes(projection='3d')
ax.scatter3D(y_pred1,[5],y_test1)
```

Out[148]:

```
<mpl_toolkits.mplot3d.art3d.Path3DCollection at 0x15f3e27b760>
```