In [1]:

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

In [2]:

```
import io
%cd "C:\Users\gouth\OneDrive\Desktop\Big Mart"
```

```
C:\Users\gouth\OneDrive\Desktop\Big Mart
```

In [3]:

```
bigmarttrain=pd.read_csv("train_v9rqX0R.csv")
```

In [4]:

```
bigmarttest=pd.read_csv("test_AbJTz2l.csv")
```

In [5]:

```
print(bigmarttrain.shape)
print(bigmarttest.shape)
```

```
(8523, 12)
(5681, 11)
```

In [6]:

```
bigmarttrain.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8523 entries, 0 to 8522
Data columns (total 12 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   Item_Identifier            8523 non-null   object
 1   Item_Weight                7060 non-null   float64
 2   Item_Fat_Content           8523 non-null   object
 3   Item_Visibility            8523 non-null   float64
 4   Item_Type                  8523 non-null   object
 5   Item_MRP                   8523 non-null   float64
 6   Outlet_Identifier          8523 non-null   object
 7   Outlet_Establishment_Year  8523 non-null   int64
 8   Outlet_Size                6113 non-null   object
 9   Outlet_Location_Type       8523 non-null   object
 10  Outlet_Type                8523 non-null   object
 11  Item_Outlet_Sales          8523 non-null   float64
dtypes: float64(4), int64(1), object(7)
memory usage: 799.2+ KB
```

In [7]:

```
bigmarttest.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5681 entries, 0 to 5680
Data columns (total 11 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   Item_Identifier            5681 non-null   object
 1   Item_Weight                4705 non-null   float64
 2   Item_Fat_Content           5681 non-null   object
 3   Item_Visibility            5681 non-null   float64
 4   Item_Type                  5681 non-null   object
 5   Item_MRP                   5681 non-null   float64
 6   Outlet_Identifier          5681 non-null   object
 7   Outlet_Establishment_Year  5681 non-null   int64
 8   Outlet_Size                4075 non-null   object
 9   Outlet_Location_Type       5681 non-null   object
 10  Outlet_Type                5681 non-null   object
dtypes: float64(3), int64(1), object(7)
memory usage: 488.3+ KB
```

In [8]:

```
# For data pre processing both must be concated
# Whatever preprocessing done on Train same must be done on the test
# Hence Concatination must be done
# But for Concatination the number of variables and sequence of variables must be same
```

In [9]:

```
bigmarttest["Item_Outlet_Sales"]="test"
```

In [10]:

```
# Combine both train and test for pre processing
combinedf=pd.concat([bigmarttrain,bigmarttest],axis=0)

# axis=0 refers to row wise concatination
```

In [11]:

```
combinedf.shape
```

Out[11]:

```
(14204, 12)
```

In [12]:

```
combinedf.isnull().sum().sort_values(ascending=False)
```

Out[12]:

```
Outlet_Size                 4016
Item_Weight                 2439
Item_Identifier                0
Item_Fat_Content               0
Item_Visibility                0
Item_Type                      0
Item_MRP                       0
Outlet_Identifier              0
Outlet_Establishment_Year      0
Outlet_Location_Type           0
Outlet_Type                    0
Item_Outlet_Sales              0
dtype: int64
```

In [13]:

```
(combinedf.isnull().sum().sort_values(ascending=False))/combinedf.shape[0]
```

Out[13]:

```
Outlet_Size                 0.282737
Item_Weight                 0.171712
Item_Identifier             0.000000
Item_Fat_Content            0.000000
Item_Visibility             0.000000
Item_Type                   0.000000
Item_MRP                    0.000000
Outlet_Identifier           0.000000
Outlet_Establishment_Year   0.000000
Outlet_Location_Type        0.000000
Outlet_Type                 0.000000
Item_Outlet_Sales           0.000000
dtype: float64
```

In [14]:

```
combinedf.Outlet_Size.value_counts(dropna=False)
```

Out[14]:

```
Medium    4655
NaN       4016
Small     3980
High      1553
Name: Outlet_Size, dtype: int64
```

In [15]:

```
# Since there are many NAs and cannot replace with existing Categories
# input with word 'Not Available'
combinedf.Outlet_Size=combinedf.Outlet_Size.fillna("NotAvailable")
```

In [16]:

```
combinedf.Item_Weight.describe()
```

Out[16]:

```
count    11765.000000
mean        12.792854
std          4.652502
min          4.555000
25%          8.710000
50%         12.600000
75%         16.750000
max         21.350000
Name: Item_Weight, dtype: float64
```

In [17]:

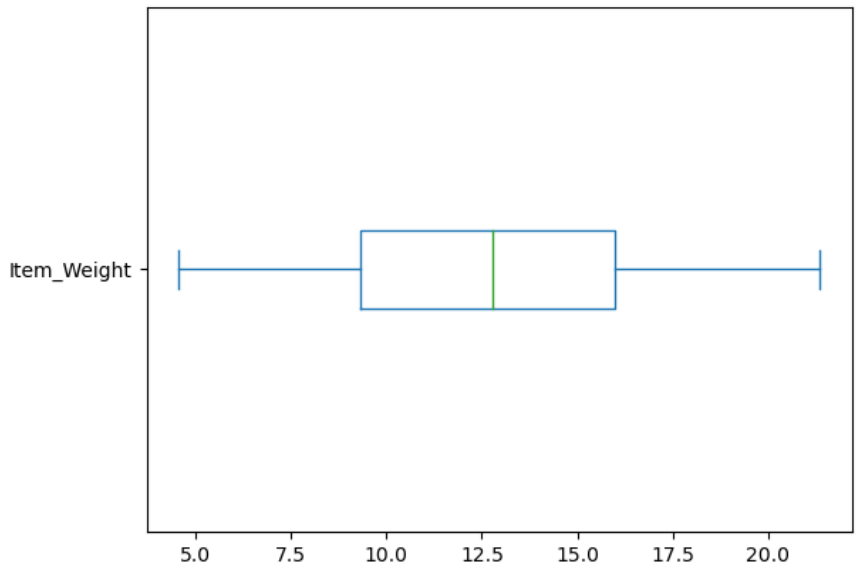
```
# Mean Inputation
combinedf.Item_Weight=combinedf.Item_Weight.fillna(combinedf.Item_Weight.mean())
```

In [18]:

```
combinedf.Item_Weight.plot(kind='box',vert=False)
```

Out[18]:

```
<AxesSubplot:>
```



In [19]:

```
combinedf.columns
```

Out[19]:

```
Index(['Item_Identifier', 'Item_Weight', 'Item_Fat_Content', 'Item_Visibility',
       'Item_Type', 'Item_MRP', 'Outlet_Identifier',
       'Outlet_Establishment_Year', 'Outlet_Size', 'Outlet_Location_Type',
       'Outlet_Type', 'Item_Outlet_Sales'],
      dtype='object')
```

In [20]:

```
combinedf.Item_Identifier.head()
```

Out[20]:

```
0    FDA15
1    DRC01
2    FDN15
3    FDX07
4    NCD19
Name: Item_Identifier, dtype: object
```

In [21]:

```
# we willl extract item_code from identifier
combinedf['Item_Code']=combinedf.Item_Identifier.apply(lambda x:x[0:2])
```

In [22]:

```
combinedf.Item_Code.value_counts()
```

Out[22]:

```
FD    10201
NC     2686
DR     1317
Name: Item_Code, dtype: int64
```

In [23]:

```
combinedf.Item_Fat_Content.value_counts()
```

Out[23]:

```
Low Fat    8485
Regular    4824
LF          522
reg         195
low fat     178
Name: Item_Fat_Content, dtype: int64
```

In [24]:

```
combinedf.Item_Fat_Content=combinedf.Item_Fat_Content.replace(["LF","low fat","Low fat"])
```

In [25]:

```
combinedf.Item_Fat_Content=combinedf.Item_Fat_Content.replace("reg","Regular")
```

In [26]:

```
combinedf.Item_Visibility.describe()
```

Out[26]:

```
count    14204.000000
mean         0.065953
std          0.051459
min          0.000000
25%          0.027036
50%          0.054021
75%          0.094037
max          0.328391
Name: Item_Visibility, dtype: float64
```

In [27]:

```
combinedf.Item_Type.value_counts()
```

Out[27]:

```
Fruits and Vegetables    2013
Snack Foods              1989
Household                1548
Frozen Foods             1426
Dairy                    1136
Baking Goods             1086
Canned                   1084
Health and Hygiene        858
Meat                      736
Soft Drinks               726
Breads                    416
Hard Drinks               362
Others                    280
Starchy Foods             269
Breakfast                 186
Seafood                    89
Name: Item_Type, dtype: int64
```

In [28]:

```
combinedf.Item_MRP.describe()
```

Out[28]:

```
count    14204.000000
mean       141.004977
std         62.086938
min         31.290000
25%         94.012000
50%        142.247000
75%        185.855600
max        266.888400
Name: Item_MRP, dtype: float64
```

In [29]:

```
combinedf.Outlet_Identifier.value_counts()
```

Out[29]:

```
OUT027    1559
OUT013    1553
OUT049    1550
OUT046    1550
OUT035    1550
OUT045    1548
OUT018    1546
OUT017    1543
OUT010     925
OUT019     880
Name: Outlet_Identifier, dtype: int64
```

In [30]:

```
# Create new variable called "Outlet_Age" as of 2022 based on Outlet_Establishment_Year
combinedf["Outlet_Age"]=2022-combinedf.Outlet_Establishment_Year
```

In [31]:

```
combinedf.Outlet_Age.describe()
```

Out[31]:

```
count    14204.000000
mean        24.169319
std          8.371664
min         13.000000
25%         18.000000
50%         23.000000
75%         35.000000
max         37.000000
Name: Outlet_Age, dtype: float64
```

In [32]:

```
combinedf.Outlet_Location_Type.value_counts()
```

Out[32]:

```
Tier 3    5583
Tier 2    4641
Tier 1    3980
Name: Outlet_Location_Type, dtype: int64
```

In [33]:

```
combinedf.Outlet_Type.value_counts()
```

Out[33]:

```
Supermarket Type1    9294
Grocery Store        1805
Supermarket Type3    1559
Supermarket Type2    1546
Name: Outlet_Type, dtype: int64
```

In [34]:

```
combinedf.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 14204 entries, 0 to 5680
Data columns (total 14 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   Item_Identifier            14204 non-null  object
 1   Item_Weight                14204 non-null  float64
 2   Item_Fat_Content           14204 non-null  object
 3   Item_Visibility            14204 non-null  float64
 4   Item_Type                  14204 non-null  object
 5   Item_MRP                   14204 non-null  float64
 6   Outlet_Identifier          14204 non-null  object
 7   Outlet_Establishment_Year  14204 non-null  int64
 8   Outlet_Size                14204 non-null  object
 9   Outlet_Location_Type       14204 non-null  object
 10  Outlet_Type                14204 non-null  object
 11  Item_Outlet_Sales          14204 non-null  object
 12  Item_Code                  14204 non-null  object
 13  Outlet_Age                 14204 non-null  int64
dtypes: float64(3), int64(2), object(9)
memory usage: 1.6+ MB
```

In [35]:

```
combinedf.columns
```

Out[35]:

```
Index(['Item_Identifier', 'Item_Weight', 'Item_Fat_Content', 'Item_Visibility',
       'Item_Type', 'Item_MRP', 'Outlet_Identifier',
       'Outlet_Establishment_Year', 'Outlet_Size', 'Outlet_Location_Type',
       'Outlet_Type', 'Item_Outlet_Sales', 'Item_Code', 'Outlet_Age'],
      dtype='object')
```

In [36]:

```
# split the data into numeric and object
numericcols=combinedf[["Item_Weight","Item_Visibility","Item_MRP","Outlet_Age","Item_Outlet_Sales",
                       "Outlet_Establishment_Year"]]
```

In [37]:

```
objectcols=combinedf[["Item_Fat_Content","Item_Type","Outlet_Identifier","Outlet_Size","Outlet_Location_Type",
                      "Outlet_Type","Item_Code",]]
```

In [38]:

```
objectcols.head()
```

Out[38]:

	Item_Fat_Content	Item_Type	Outlet_Identifier	Outlet_Size	Outlet_Location_Type	Outlet_Type	Item_Code
0	Low Fat	Dairy	OUT049	Medium	Tier 1	Supermarket Type1	FD
1	Regular	Soft Drinks	OUT018	Medium	Tier 3	Supermarket Type2	DR
2	Low Fat	Meat	OUT049	Medium	Tier 1	Supermarket Type1	FD
3	Regular	Fruits and Vegetables	OUT010	NotAvailable	Tier 3	Grocery Store	FD
4	Low Fat	Household	OUT013	High	Tier 3	Supermarket Type1	NC

In [39]:

```
from sklearn.preprocessing import LabelEncoder
```

In [40]:

```
le=LabelEncoder()
```

In [41]:

```
objectcols_labelEncode=objectcols.apply(le.fit_transform)
```

In [42]:

```
objectcols.head(3)
```

Out[42]:

	Item_Fat_Content	Item_Type	Outlet_Identifier	Outlet_Size	Outlet_Location_Type	Outlet_Type	Item_Code
0	Low Fat	Dairy	OUT049	Medium	Tier 1	Supermarket Type1	FD
1	Regular	Soft Drinks	OUT018	Medium	Tier 3	Supermarket Type2	DR
2	Low Fat	Meat	OUT049	Medium	Tier 1	Supermarket Type1	FD

In [43]:

```
objectcols_labelEncode.head(3)
```

Out[43]:

	Item_Fat_Content	Item_Type	Outlet_Identifier	Outlet_Size	Outlet_Location_Type	Outlet_Type	Item_Code
0	0	4	9	1	0	1	1
1	1	14	3	1	2	2	0
2	0	10	9	1	0	1	1

In [44]:

```
objectcols_dummy=pd.get_dummies(objectcols)
```

In [45]:

```
objectcols_dummy.head(3)
```

Out[45]:

	Item_Fat_Content_Low Fat	Item_Fat_Content_Regular	Item_Type_Baking Goods	Item_Type_Breads	Item_Type_Breakfast	Item_Type_Canned	Item_Type_D
0	1	0	0	0	0	0	
1	0	1	0	0	0	0	
2	1	0	0	0	0	0	

3 rows × 42 columns

In [46]:

```
print(objectcols.shape)
print(objectcols_labelEncode.shape)
print(objectcols.shape)
```

```
(14204, 7)
(14204, 7)
(14204, 7)
```

In [47]:

```
numericcols.head()
```

Out[47]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age	Item_Outlet_Sales	Outlet_Establishment_Year
0	9.30	0.016047	249.8092	23	3735.138	1999
1	5.92	0.019278	48.2692	13	443.4228	2009
2	17.50	0.016760	141.6180	23	2097.27	1999
3	19.20	0.000000	182.0950	24	732.38	1998
4	8.93	0.000000	53.8614	35	994.7052	1987

In [48]:

```
from sklearn.preprocessing import StandardScaler
```

In [49]:

```
scaler=StandardScaler()
```

In [50]:

```
numeric_scaled=scaler.fit_transform(numericcols.iloc[:,0:4])
```

In [51]:

```
pd.DataFrame(numeric_scaled,columns=['Item_Weight',"Item_Visibility","Item_MRP","Outlet_Age"]).head()
```

Out[51]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age
0	-0.824939	-0.969852	1.752511	-0.139681
1	-1.623224	-0.907063	-1.493696	-1.334228
2	1.111729	-0.956000	0.009874	-0.139681
3	1.513233	-1.281712	0.661838	-0.020226
4	-0.912325	-1.281712	-1.403623	1.293777

In [52]:

```
from sklearn.preprocessing import MinMaxScaler
```

In [53]:

```
normalize=MinMaxScaler()
```

In [54]:

```
numeric_normalize=normalize.fit_transform(numericcols.iloc[:,0:4])
```

In [55]:

```
pd.DataFrame(numeric_normalize,columns=['Item_Weight',"Item_Visibility","Item_MRP","Outlet_Age"]).head()
```

Out[55]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age
0	0.282525	0.048866	0.927507	0.416667
1	0.081274	0.058705	0.072068	0.000000
2	0.770765	0.051037	0.468288	0.416667
3	0.871986	0.000000	0.640093	0.458333
4	0.260494	0.000000	0.095805	0.916667

In [56]:

```
from sklearn.preprocessing import RobustScaler
```

In [57]:

```
robust=RobustScaler()
```

In [58]:

```
numeric_robust=robust.fit_transform(numericcols.iloc[:,0:4])
```

In [59]:

```
pd.DataFrame(numeric_robust,columns=['Item_Weight',"Item_Visibility","Item_MRP","Outlet_Age"]).head()
```

Out[59]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age
0	-0.521322	-0.566751	1.171145	0.000000
1	-1.025799	-0.518530	-1.023237	-0.588235
2	0.702559	-0.556113	-0.006849	0.000000
3	0.956290	-0.806258	0.433868	0.058824
4	-0.576545	-0.806258	-0.962349	0.705882

In [60]:

```
numeric_scaled=pd.DataFrame(numeric_scaled,columns=['Item_Weight',"Item_Visibility",
                                                    "Item_MRP","Outlet_Age"]).reset_index(drop=True)
```

In [61]:

```
objectcols_labelEncode=objectcols_labelEncode.reset_index(drop=True)
```

In [62]:

```
combinedf_clean=pd.concat([numeric_scaled,objectcols_labelEncode],axis=1)
```

In [63]:

```
numericcols=numericcols.reset_index(drop=True)
```

In [64]:

```
# Add Dependent Variable
combinedf_clean['Item_Outlet_Sales']=numericcols.Item_Outlet_Sales
```

In [65]:

```
combinedf_clean.tail()
```

Out[65]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age	Item_Fat_Content	Item_Type	Outlet_Identifier	Outlet_Size	Outlet_Location_Type	Ou
14199	-0.541524	-1.019425	0.005000	0.099229	1	13	8	3	0	
14200	-1.226443	1.497142	0.453249	-1.334228	1	15	3	1	2	
14201	-0.659613	0.147226	-0.358558	-0.498045	0	8	7	2	1	
14202	0.592135	-1.281712	1.185747	-1.095319	1	3	2	2	1	
14203	-0.777703	0.753397	-0.985894	-0.498045	1	3	7	2	1	

In [66]:

```
# Split Data back to Train and Test

bigmarttrain_df=combinedf_clean[combinedf_clean.Item_Outlet_Sales!="test"]
bigmarttest_df=combinedf_clean[combinedf_clean.Item_Outlet_Sales=="test"]
```

In [67]:

```
bigmarttest_df=bigmarttest_df.drop("Item_Outlet_Sales",axis=1)
```

In [68]:

```
bigmarttest_df.head()
```

Out[68]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Age	Item_Fat_Content	Item_Type	Outlet_Identifier	Outlet_Size	Outlet_Location_Type	Ou
8523	1.879311e+00	-1.134699	-0.533831	-0.139681	0	13	9	1	0	
8524	-1.061118e+00	-0.534917	-0.864708	-1.095319	1	4	2	2	1	
8525	4.268098e-01	0.653405	1.622763	-0.020226	0	11	0	2	2	
8526	-1.293754e+00	-0.982657	0.225966	-1.095319	0	13	2	2	1	
8527	1.388671e-13	1.023121	1.501577	1.532686	1	4	5	1	2	

In [69]:

```
bigmarttrain_df.Item_Outlet_Sales.dtype
```

Out[69]:

```
dtype('O')
```

In [70]:

```
bigmarttrain_df.Item_Outlet_Sales=bigmarttrain_df.Item_Outlet_Sales.astype("float64")
```

```
C:\Users\gouth\AppData\Local\Temp\ipykernel_23756\3272639241.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  bigmarttrain_df.Item_Outlet_Sales=bigmarttrain_df.Item_Outlet_Sales.astype("float64")
```

In [71]:

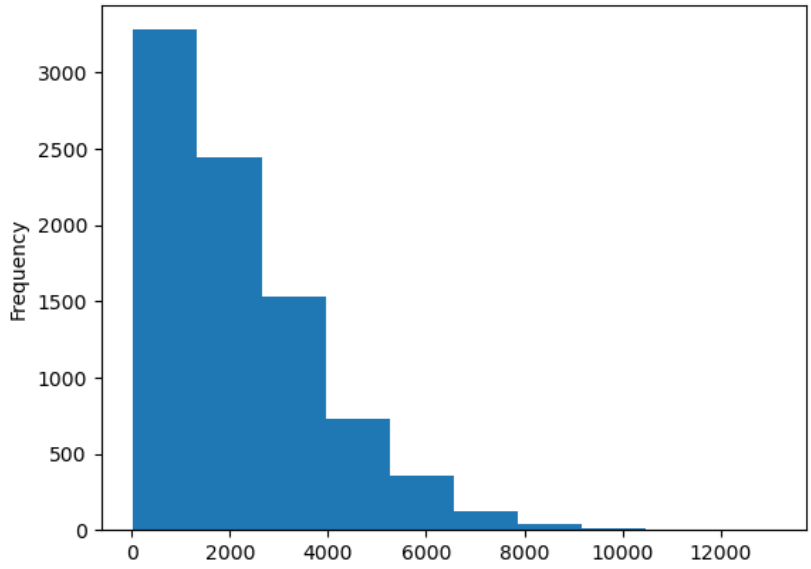
```
y=bigmarttrain_df.Item_Outlet_Sales # dependent variable
x= bigmarttrain_df.drop("Item_Outlet_Sales",axis=1)
```

In [72]:

```
y.plot(kind="hist")
```

Out[72]:

```
<AxesSubplot:ylabel='Frequency'>
```

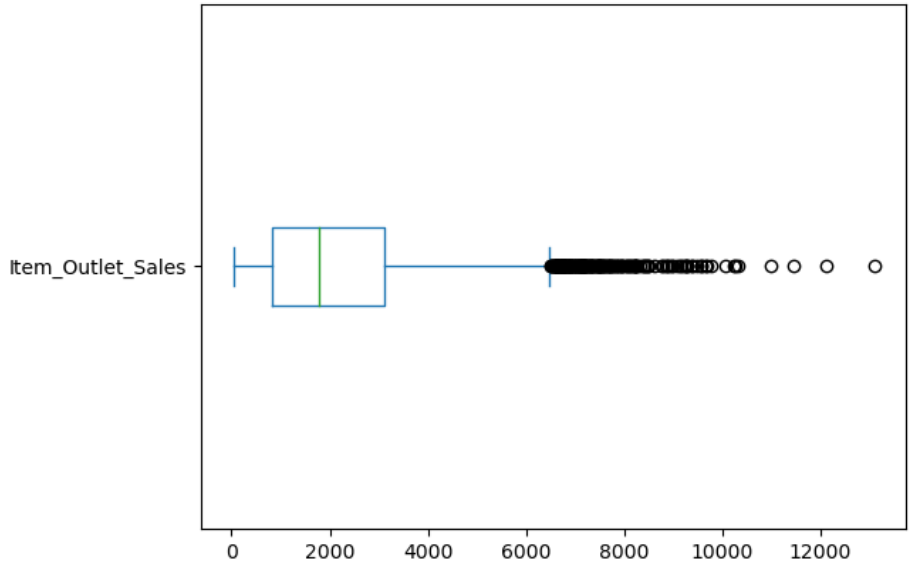


In [73]:

```
y.plot(kind="box",vert=False)
```

Out[73]:

```
<AxesSubplot:>
```

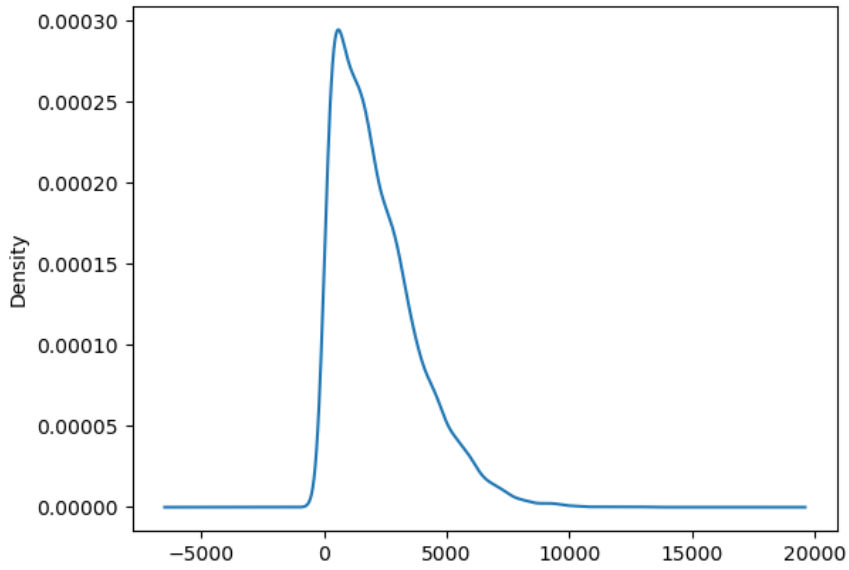


In [74]:

```
y.plot(kind="density")
```

Out[74]:

```
<AxesSubplot:ylabel='Density'>
```

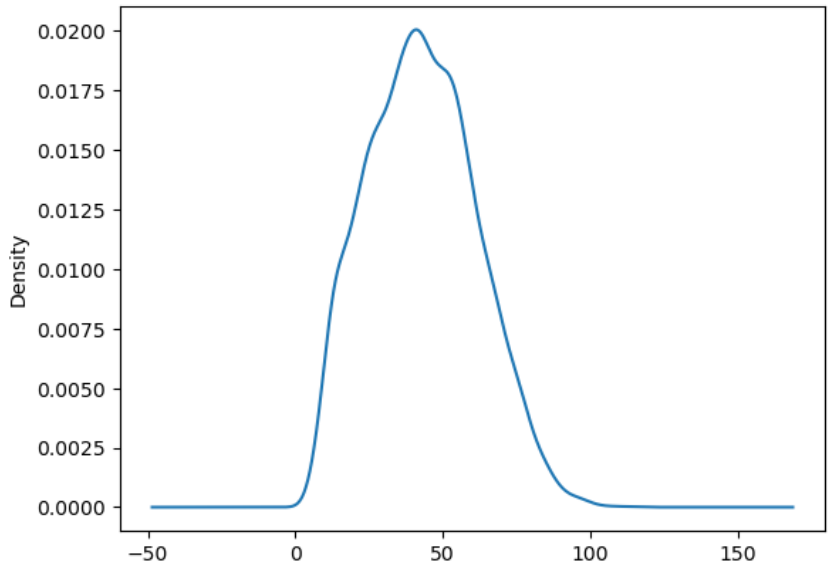


In [75]:

```
np.sqrt(y).plot(kind="density")
```

Out[75]:

```
<AxesSubplot:ylabel='Density'>
```



In [76]:

```
from sklearn.linear_model import LinearRegression
```

In [77]:

```
reg=LinearRegression()
```

In [78]:

```
regmodel=reg.fit(x,y)
```

In [79]:

```
regmodel.score(x,y)
```

Out[79]:

```
0.5037361059653791
```

In [80]:

```
regmodel2=reg.fit(x,np.log(y))
```

In [81]:

```
regmodel2.score(x,np.log(y))
```

Out[81]:

```
0.5719030911222629
```

In [82]:

```
regmodel3=reg.fit(x,np.sqrt(y))
```

In [83]:

```
regmodel3.score(x,np.sqrt(y))
```

Out[83]:

```
0.5582643727379528
```

In [84]:

```
regtestpredict=regmodel.predict(bigmarttest_df)
```

In [85]:

```
regtestpredict
```

Out[85]:

```
array([44.01422667, 31.62279229, 40.67303029, ..., 39.11203577,
       53.59463696, 32.53884437])
```

In [86]:

```
pd.DataFrame(regtestpredict).to_csv("reg.csv")
```