read file and plot w csv

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This file shows a possible procedure for: 1. Reading data in from a "comma separated value", "csv" file 2. Plotting the data with the matplotlib library 3. Creating a "by-hand" fitline to describe the data. 4. Using scipy.optimize.curve_fit to find the equation of best fit.

The included sienna.csv file contains price, mileage, and year information from internet ads for Toyota Sienna minivans. For typical data, see https://rmn.craigslist.org/search/cta?query=Sienna&auto_make_model=Sienna&min_auto_year=2006&max_a

In [36]:
```
# Using a comma-separated-values (CSV) library
import csv
```

In [37]:
```
# the data will be stored in lists
price=[]
model_year=[]
mileage=[]
# read from the data file
with open("sienna.csv") as csvfile:
    datafile=csv.reader(csvfile)
    # read in information, line by line
    for row in datafile:
        # within each row, add elements to the appropariate list
        price.append(row[1])
        model_year.append(row[2])
        mileage.append(row[3])
```

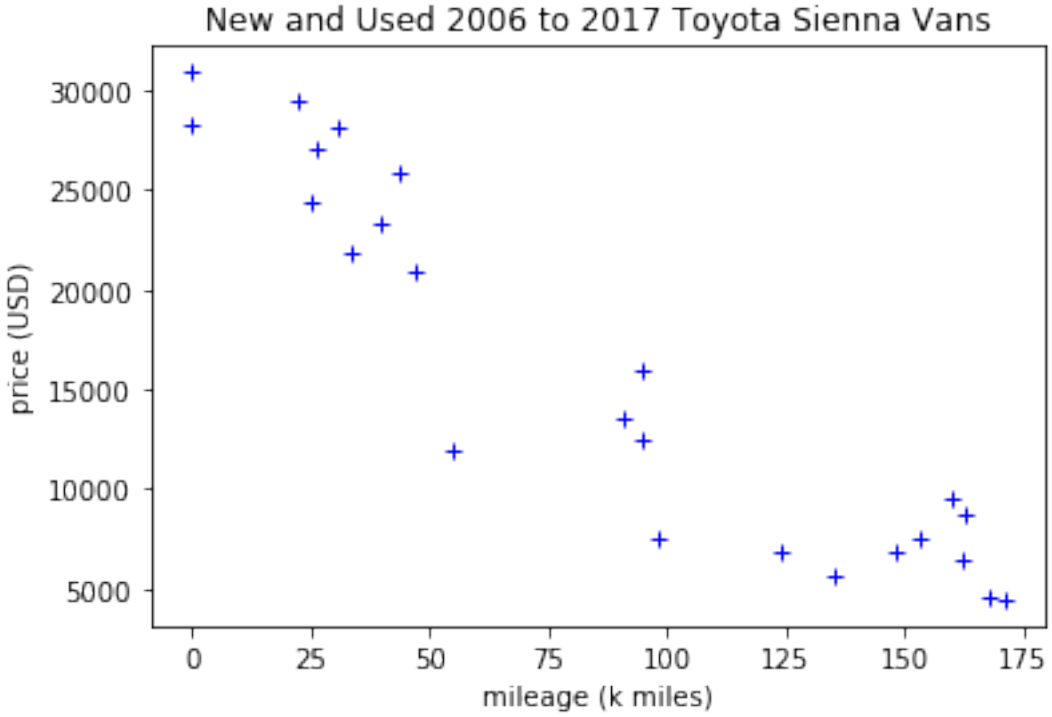
In [38]:
```
# the first few rows are text labels.  Need to remove these lines
# with a slice.  x[2:] is the list x, starting with the 3rd element
print("before: ",price)
price=price[2:]
print("after: ",price)
model_year=model_year[2:]
mileage=mileage[2:]
```

```
before:  ['price', '(USD)', '30900', '29500', '28200', '28100', '27000', '25790', '24400', '2325
after:  ['30900', '29500', '28200', '28100', '27000', '25790', '24400', '23250', '21890', '20900
```

In [39]:
```
# also, note that the numbers are read in as text strings
# the following commands cast them into integer format
print(price[0],model_year[0],mileage[0])
price = [ int(x) for x in price ]
model_year = [ int(x) for x in model_year]
mileage = [ float(x) for x in mileage ]
print(price[0],model_year[0],mileage[0])
```

```
30900 2017 0
30900 2017 0.0
```

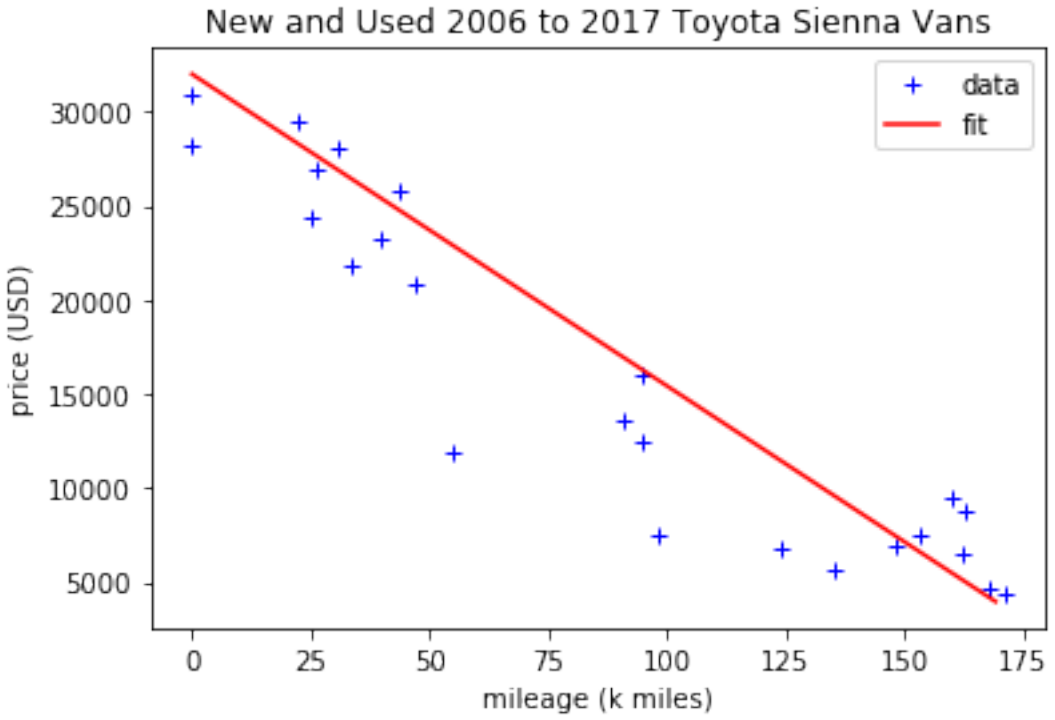
In [42]:
```
import matplotlib.pyplot as plt
plt.plot(mileage,price,"b+")
plt.ylabel("price (USD)")
plt.xlabel("mileage (k miles)")
plt.title("New and Used 2006 to 2017 Toyota Sienna Vans")
plt.show()
```



In [43]:
```
# fitting via trial and error
# fit parameters:
intercept=32000
slope=-29000/175
print("using intercept = ",intercept,"(USD)")
```

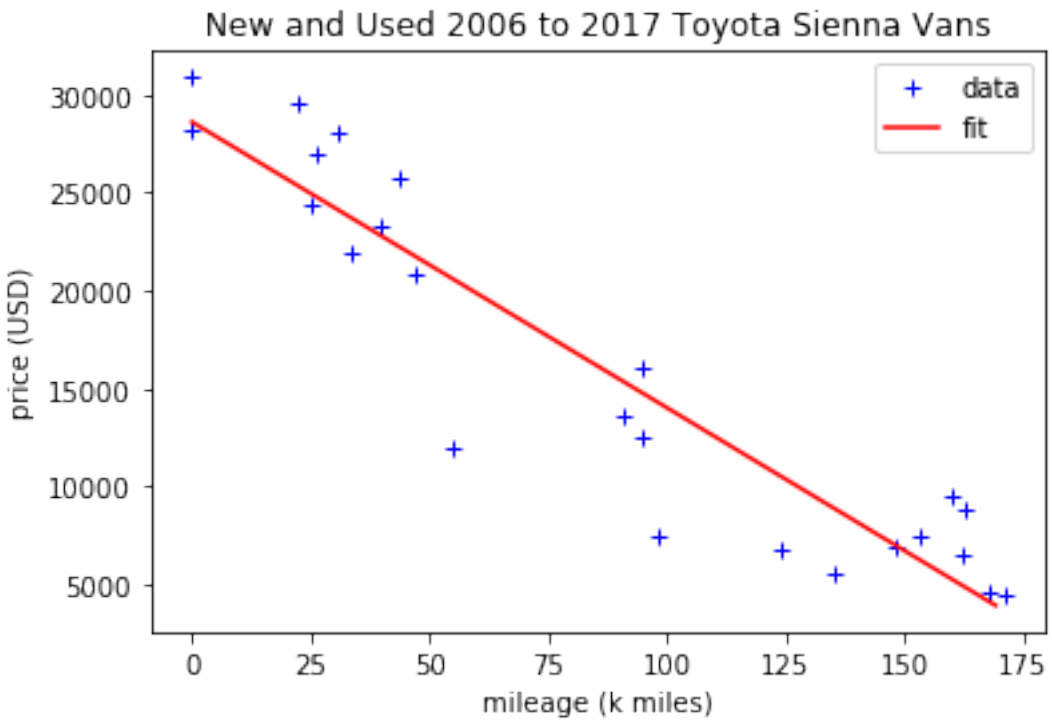
```
        print("using slope = ",slope,"($/kmile)")
        fit_mileage=[]
        fit_price=[]
        # the following list of points will be a plot of the fitline
        for i in range(30):
            m=i*(175/30)
            p=slope*m+intercept

            fit_mileage.append(m)
            fit_price.append(p)

        import matplotlib.pyplot as plt
        plt.plot(mileage,price,"b+",label="data")
        plt.plot(fit_mileage,fit_price,"r-",label="fit")
        plt.ylabel("price (USD)")
        plt.xlabel("mileage (k miles)")
        plt.legend()
        plt.title("New and Used 2006 to 2017 Toyota Sienna Vans")
        plt.show()
```

```
using intercept =  32000 (USD)
using slope =  -165.71428571428572 ($/kmile)
```



Python also contains functions that will find a trendline (in the same way excel does). I'm following the tutorial online, here: http://www2.mpia-hd.mpg.de/~robitaille/PY4SCI_SS_2014/_static/15.%20Fitting%20models%20to%20data.html

```
In [44]: # import a curve-fitting library
         from scipy.optimize import curve_fit

In [45]: # define a function that I think describes the data
         def line(x,a,b):
             return a*x + b
         # note, "b" will the the y-intercept (in US dollars)
         # and "a" will be the slope (in dollars/k-miles)

In [49]: # this is the language from the example
         popt,pcov=curve_fit(line,mileage,price)

In [50]: #popt is the coefficients for the model
         print(popt)

[  -145.98942722  28613.95561742]


In [52]: # now, pick out the fit values and plot the fit
         slope=popt[0]
         intercept=popt[1]

         print("using intercept = ",intercept,"(USD)")
         print("using slope = ",slope,"($/kmile)")
         fit_mileage=[]
         fit_price=[]
         # the following list of points will be a plot of the fitline
         for i in range(30):
             m=i*(175/30)
             p=slope*m+intercept

             fit_mileage.append(m)
             fit_price.append(p)

         import matplotlib.pyplot as plt
         plt.plot(mileage,price,"b+",label="data")
         plt.plot(fit_mileage,fit_price,"r-",label="fit")
         plt.ylabel("price (USD)")
         plt.xlabel("mileage (k miles)")
         plt.legend()
         plt.title("New and Used 2006 to 2017 Toyota Sienna Vans")
         plt.show()

using intercept =  28613.9556174 (USD)
using slope =  -145.989427222 ($/kmile)
```


New and Used 2006 to 2017 Toyota Sienna Vans
data
fit
price (USD)
30000
25000
20000
15000
10000
5000
0
25
50
75
100
125
150
175
mileage (k miles)

In [ ]: