Q3

November 21, 2021

[95]:
```
%run lib.ipynb
```

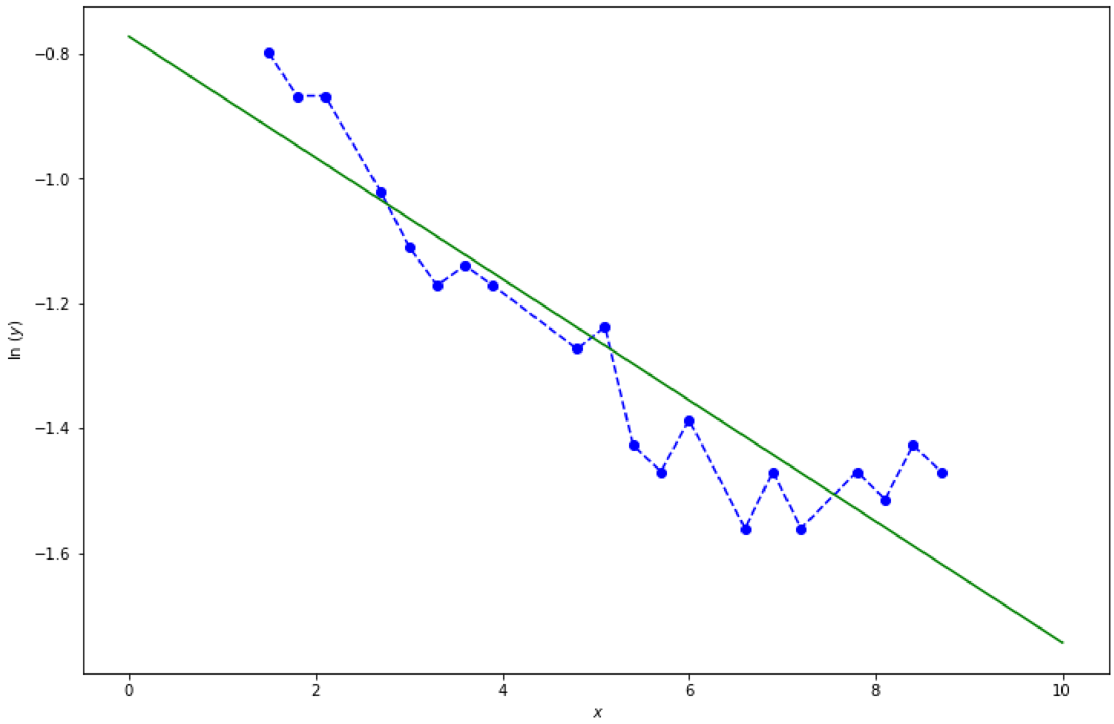
[96]:
```
x = [1.5,1.8,2.1,2.7,3.0,3.3,3.6,3.9,4.8,5.1,5.4,5.7,6.0,6.6,6.9,7.2,7.8,8.1,8.
↪4,8.7]
y = [0.45,0.42,0.42,0.36,0.33,0.31,0.32,0.31,0.28,0.29,0.24,0.23,0.25,0.21,0.
↪23,0.21,0.23,0.22,0.24,0.23]
import math
#(i) y = (sigma1_x) e^(alpha1 x). Take ln both sides. lny = c1 + c2 x
lny = [math.log(i) for i in y]
linearfit(x,lny)
```

```
The slope is -0.0971676482997938
The intercept is -0.7720858223962891
The Corellation coefficient 'r' is 0.9231412967039344
```

[97]:
```
# the slope = ln(sigma1_0) ; intercept = alpha1
sigma1_0 = math.exp(-0.0971676482997938)
alpha1 = -0.7720858223962891
print("The value of sigma_0 = " + str(sigma1_0))
print("The value of alpha = " + str(alpha1))
```

```
The value of sigma_0 = 0.9074038686650271
The value of alpha = -0.7720858223962891
```

[98]:
```
t = np.linspace(0,10,3000,endpoint= True)
s = -0.7720858223962891 + t*-0.0971676482997938
plt.figure(figsize = (12, 8))
plt.plot(x,lny,'bo--')
plt.plot(t,s,'g', label='Precise Soln')
plt.xlabel(" $x$")
plt.ylabel("ln $(y)$")
plt.show()
```



[99]:
```
#(ii) y = (sigma2_x) T^(alpha2). Take ln both sides. lny = c3 + c4 lnx
lny = [math.log(i) for i in y]
lnx = [math.log(i) for i in x]
linearfit(lnx,lny)
```

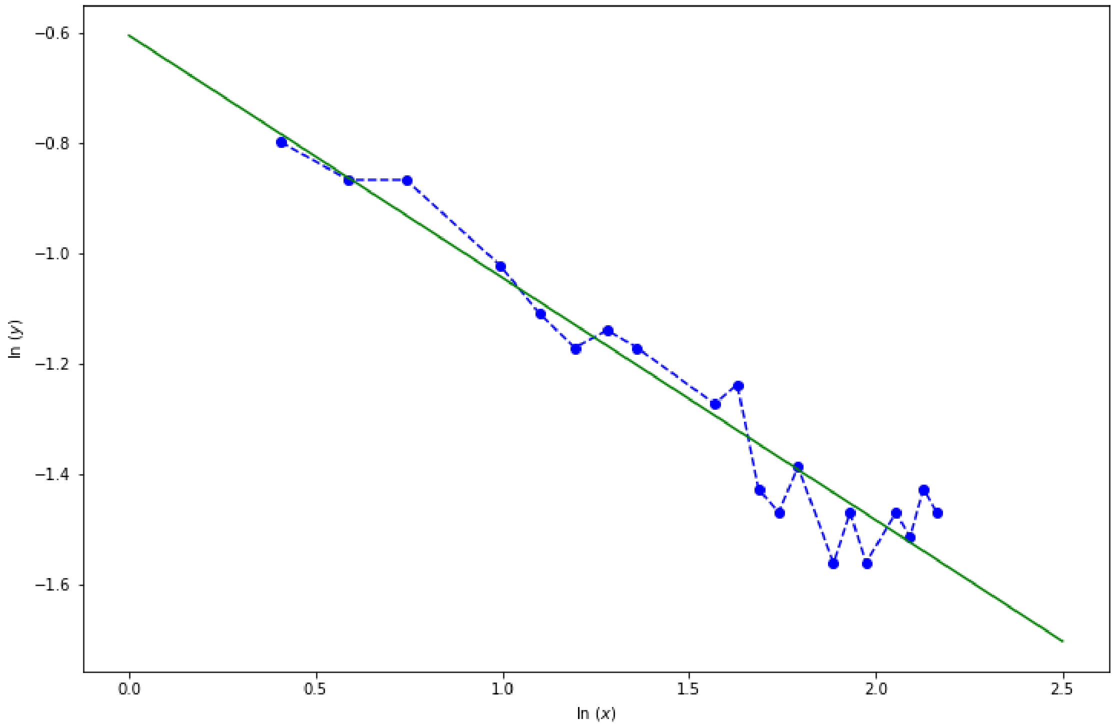
```
The slope is -0.438496882888816846
The intercept is -0.6060230029837954
The Corellation coefficient 'r' is 0.9644824067362816
```

[100]:
```
# the slope = ln(sigma2_0) ; intercept = ln(alpha2)
sigma2_0 = math.exp(-0.438496882888816846)
alpha2 = -0.6060230029837954
print("The value of sigma_0 = " + str(sigma2_0))
print("The value of alpha = " + str(alpha2))
```

```
The value of sigma_0 = 0.6450052111683877
The value of alpha = -0.6060230029837954
```

[101]:
```
t = np.linspace(0,2.5,3000,endpoint= True)
s = -0.6060230029837954 + t*-0.438496882888816846
plt.figure(figsize = (12, 8))
plt.plot(lnx,lny,'bo--')
plt.plot(t,s,'g', label='Precise Soln')
plt.xlabel("ln $(x)$")
```

```
plt.ylabel("ln $(y)$")
plt.show()
```



[102]:
```
print("Since the r value of (ii) is closer to 1 than (i), the data is fit better␣
↪to the second equation(ii)")
```

```
Since the r value of (ii) is closer to 1 than (i), the data is fit better to the
second equation(ii)
```