

[실습예제 10-2][도전!]

```
11 def E(a,b,c):
12     val = 0.0
13     for i in range(N):
14         val += (a*x[i]**2+b*x[i]+c-t[i])**2
15     return 0.5*val/N
16
17 def Ea(a,b,c):
18     val = 0.0
19     for i in range(N):
20         val += (a*x[i]**2+b*x[i]+c-t[i])*x[i]**2
21     return val/N
22
23 def Eb(a,b,c):
24     val = 0.0
25     for i in range(N):
26         val += (a*x[i]**2+b*x[i]+c-t[i])*x[i]
27     return val/N
28
29 def Ec(a,b,c):
30     val = 0.0
31     for i in range(N):
32         val += (a*x[i]**2+b*x[i]+c-t[i])
33     return val/N
34
35 np.random.seed(17)
36 oa, ob, oc = np.random.rand(), np.random.rand(), np.random.rand()
37 MaxIter = 1000
38 ns = MaxIter/10
39 alpha = 0.25
40 print('n={:3d}, En={:.4f}'.format(0,E(oa,ob,oc)))
41 for n in range(MaxIter):
42     grada, gradb, gradc = Ea(oa,ob,oc), Eb(oa,ob,oc), Ec(oa,ob,oc)
43     na, nb, nc = oa-alpha*grada, ob-alpha*gradb, oc-alpha*gradc
44     err = np.sqrt((na-oa)**2+(nb-ob)**2+(nc-oc)**2)
45     oa, ob, oc = na, nb, nc
46     if (n+1)%ns == 0:
47         print('n={:3d}, En={:.4f}'.format(n+1,E(oa,ob,oc)))
48     if err < 1.0e-5:
49         break
50
51 print('n={:3d}, En={:.4f}'.format(n+1,E(oa,ob,oc)))
```

```
n= 0, En=3.1268
n=100, En=0.2707
n=200, En=0.2689
n=300, En=0.2689
n=385, En=0.2689
```

```
52 xx = np.linspace(-1, 1)
53 yy = oa*xx**2 + ob*xx + oc
54 plt.plot(xx, yy, 'r--')
```

```
55 plt.plot(x, t, 'k.')
56 plt.show()
```

