

[실습예제 9-2][도전!]

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 ff = lambda x, y: 3*x**2 + 4*np.sin(x)*np.cos(y) + 2*y**2
5 fx = lambda x, y: 6*x + 4*np.cos(x)*np.cos(y)
6 fy = lambda x, y: -4*np.sin(x)*np.sin(y) + 4*y
7
8 ox, oy = 1, 1
9 MaxIter = 20
10 alpha = 0.05
11
12 xp, yp = np.zeros(MaxIter+1), np.zeros(MaxIter+1)
13 xp[0], yp[0] = ox, oy
14 for n in range(MaxIter):
15     gradx, grady = fx(ox,oy), fy(ox,oy)
16     nx, ny = ox-alpha*gradx, oy-alpha*grady
17     ox, oy = nx, ny
18     xp[n+1], yp[n+1] = ox, oy
19
20 xx, yy = np.meshgrid(np.linspace(-1,1), np.linspace(-1,1))
21 fig = plt.figure()
22 ax = plt.axes()
23 ax.contour(xx, yy, ff(xx,yy), 20, cmap='jet')
24 ax.set_aspect('equal', adjustable='box')
25 plt.plot(xp, yp, 'ko--')
26 plt.show()
```

