

example 12.1

예제 12.1

$$x_1 = \frac{7.85 + 0.1x_2 + 0.2x_3}{3}$$

$$x_2 = \frac{-19.3 - 0.1x_1 + 0.2x_3}{7}$$

$$x_3 = \frac{71.4 - 0.3x_1 + 0.2x_2}{10}$$

$$x_2 = x_3 = 0$$

$$x_1 = \frac{7.85 + 0.1(0) + 0.2(0)}{3} = 2.616667$$

$$x_2 = \frac{-19.3 - 0.1(2.616667) + 0.2(0)}{7} = -2.794524$$

$$x_3 = \frac{71.4 - 0.3(2.616667) + 0.2(-2.794524)}{10} = 7.005610$$

두번째 반복

$$x_1 = 2.990557, \quad x_2 = -2.499628, \quad x_3 = 7.000291$$

$$E_{n,1} = \left| \frac{2.990557 - 2.616667}{2.990557} \right| \times 100\% = 12.5\%$$

### example 12.2

예제 12.2

$$x_1 = \frac{8+2x_2}{10} = 0.8 + 0.2x_2$$

$$x_2 = \frac{9+3x_1}{12} = 0.75 + 0.25x_1$$

①  $x_1 = x_1 = 0$  가정

$$x_1 = 0.8 + 0.2(0) = 0.8$$

$$x_{2r} = 0.75 + 0.25(0.8) = 0.96$$

$$x_2 = 0.75 + 0.25(0.96) = 0.99$$

$$x_{2r} = 0.75 + 0.25(0.99) = 1.188$$

②  $x_1 = 1.0396$

$$x_{1r} = 1.0532$$

$$x_2 = 1.01328$$

$$x_{2r} = 0.978336$$

3번째 반복을 통해  $x_1 = 0.9841772$  과  $x_2 = 0.999586$  은

$x_1 = x_2 = 1$  에 수렴한다

### example 12.3

예제 12.3

$$x_1 = \frac{10-x_2^2}{x_2} \quad x_2 = 57-3x_1x_2$$

3가지 점을 근사

$$x_1 = \frac{10-(1.5)^2}{3.5} = 2.21429$$

$$x_2 = 57-3(2.21429)(3.5) = -24.39516$$

<2번째>

$$x_1 = -0.20910$$

$$x_2 = 429.709$$

→ 절댓값이 4 이하

$$x_1 = \sqrt{10-x_2} \quad x_2 = \sqrt{57-3x_1}$$

$$x_1 = \sqrt{10-1.5(3.5)} = 2.17945$$

$$x_2 = \sqrt{57-3.5} = 2.86051$$

$$x_1 = \sqrt{10-2.17945(2.86051)} = 1.94053$$

$$x_2 = \sqrt{57-2.86051} = 3.04955$$

∴ 정해  $x_1 = 2$  과  $x_2 = 3$  에 수렴한다.

example 12.4

$\sigma = \|dx\|$  12.4

최기가점

$$\frac{\partial f_{1,0}}{\partial x_1} = 2x_1 + x_2 = 2(1.5) + 3.5 = 6.5$$

$$\frac{\partial f_{1,0}}{\partial x_2} = 1.5, \quad \frac{\partial f_{2,0}}{\partial x_1} = 36.75, \quad \frac{\partial f_{2,0}}{\partial x_2} = 32.5$$

Jacobian 행렬

$$\Rightarrow 6.5(32.5) - 1.5(36.75) = 156.125$$

$$J_{1,0} = (1.5)^2 + 1.5(3.5) - 10 = -2.5$$

$$J_{2,0} = 3.5 + 3(1.5)(3.5)^2 - 57 = 1.625$$

$$x_1 = 1.5 - \frac{-2.5(32.5) - 1.625(1.5)}{156.125} = 2.03603$$

$$x_2 = 3.5 - \frac{1.625(6.5) - (-2.5)(36.75)}{156.125} = 2.64388$$

$\therefore$  정해  $x_1 = 2, x_2 = 3$  이다

case by study

```
>> function [J,f] = jfreact(x,varargin)
del = 0.000001;
df1dx1=(u(x(1)+del*x(1),x(2))-u(x(1),x(2)))/(del*x(1));
df1dx2=(u(x(1),x(2)+del*x(2))-u(x(1),x(2)))/(del*x(2));
df2dx1=(v(x(1)+del*x(1),x(2))-v(x(1),x(2)))/(del*x(1));
df2dx2=(v(x(1),x(2)+del*x(2))-v(x(1),x(2)))/(del*x(2));
J=[df1dx1 df1dx2;df2dx1 df2dx2];
f1=u(x(1),x(2));
f2=v(x(1),x(2));
f=[f1;f2];
function f=u(x,y)
f = (5 + x + y) / (50 - 2 * x - y) ^ 2 / (20 - x) - 0.0004;
function f=v(x,y)
f = (5 + x + y) / (50 - 2 * x - y) / (10 - y) - 0.037;
```

x =  
3.3366e+00  
2.6772e+00  
f =  
-7.1286e-17  
8.5973e-14  
ea = 5.2237e-10  
iter = 4