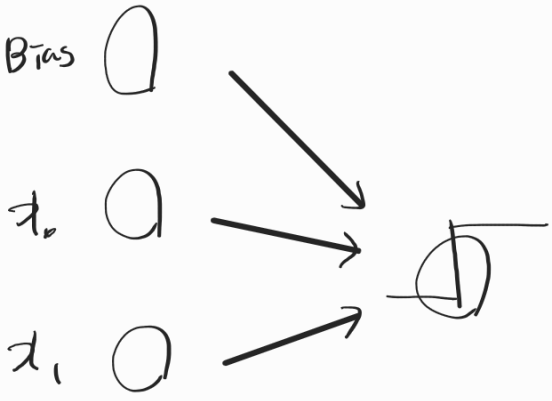
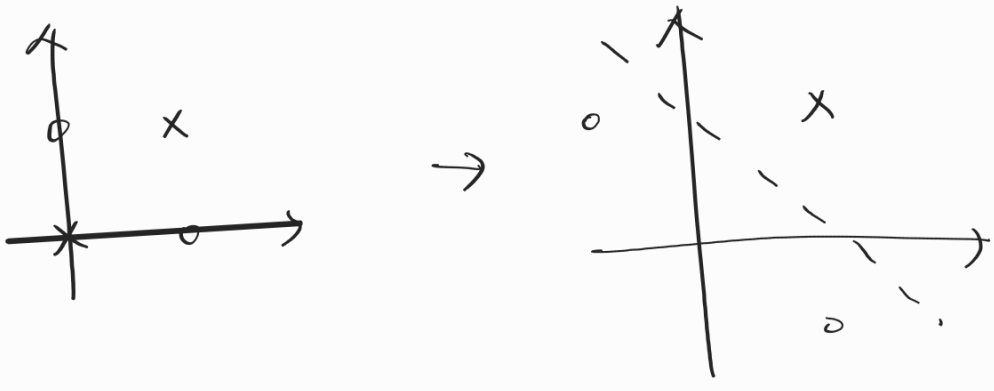
* Single perceptron은 XOR 문제를 해결 못함



x_0	x_1	step( )	y
0	0		X
0	1		1
1	0		1
1	1		0

* non-linearity를 준 multi layer perceptron은 가능.

- 수학적 접근 : ex) (0,0)인 data를 다른 domain으로 옮겨 푼다.



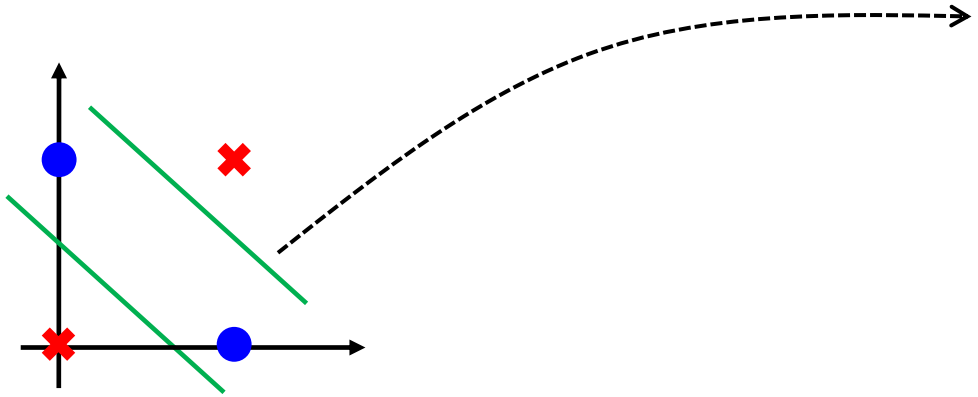
- 직관: data의 feature들 가중치를 주고 추출. (중요도를 보고)
  feature을 재조합하여 새로운 feature을 만들다. 이 새로운 feature는
  이전 layer보다 효과적인 feature 여서 이지 구분가능.

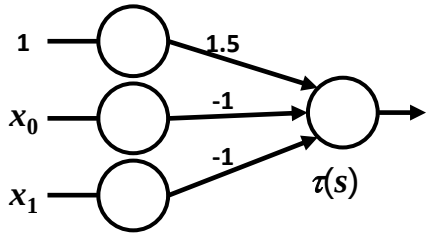
  → 정리한다!

Neural network

- Single-layer perceptron (SLP)
  - XOR problem

input: 2x1 output: 1





XOR은 표현하지 못한다.

	(x_0, x_1)	s	$\tau(s)$	Ground-truth
Error	(0,0)	1.5	1	0
	(0,1)	0.5	1	1
	(1,0)	0.5	1	1
	(1,1)	-0.5	0	0

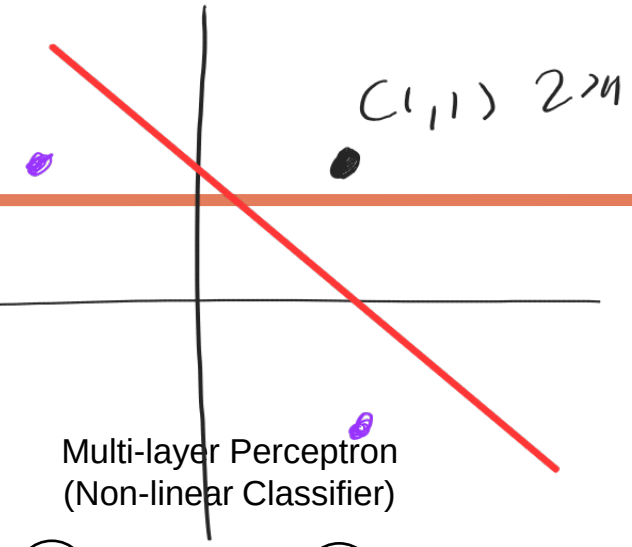
Step($W_0 x_0 + W_1 x_1 + Bias$) = y

0 0
0 1
1 0
1 1

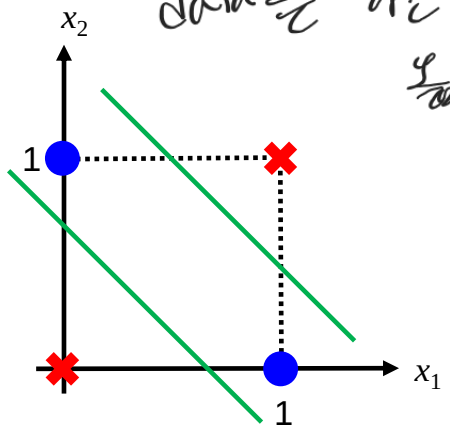
0 < weighted sum → $y=1$

0 > → $y=0$

Neural network

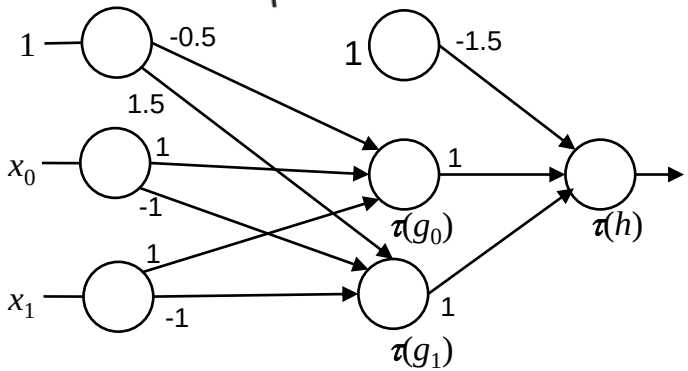


- Multi-layer perceptron (MLP)
  - XOR problem
    - Non-linear separable problem



(0,0)의 data들을 (-1,1)로 옮김

Multi-layer Perceptron
(Non-linear Classifier)



(x_0, x_1)	(g_0, g_1)	$(\tau(g_0), \tau(g_1))$	h	$\tau(h)$
(0,0)	(-0.5,1.5)	(-1,+1)	-1.5	0
(0.1)	(0.5,0.5)	(+1,+1)	0.5	1
(1,0)	(0.5,0.5)	(+1,+1)	0.5	1
(1,1)	(1.5,-0.5)	(+1,-1)	-1.5	0