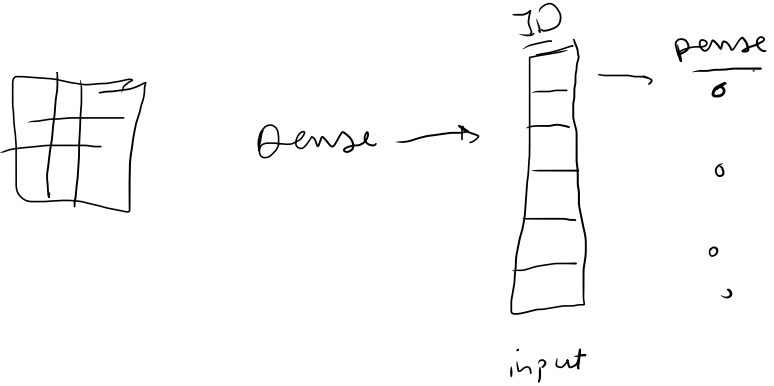
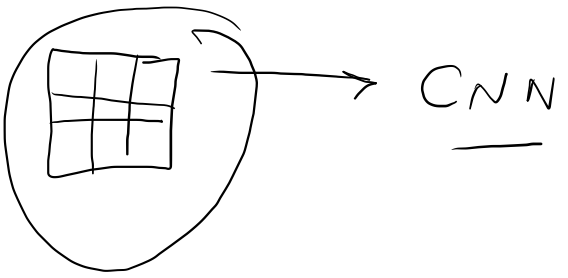
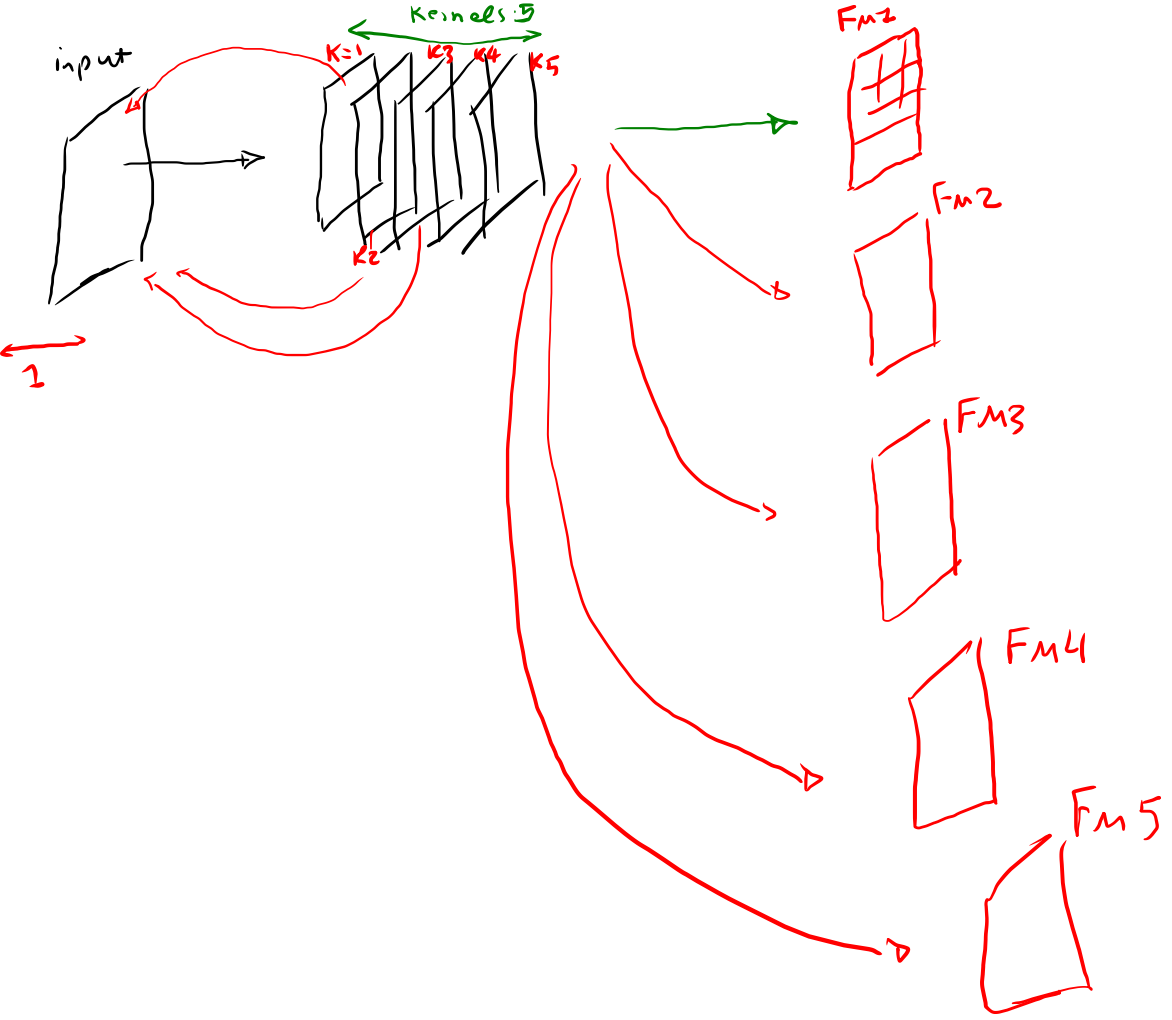
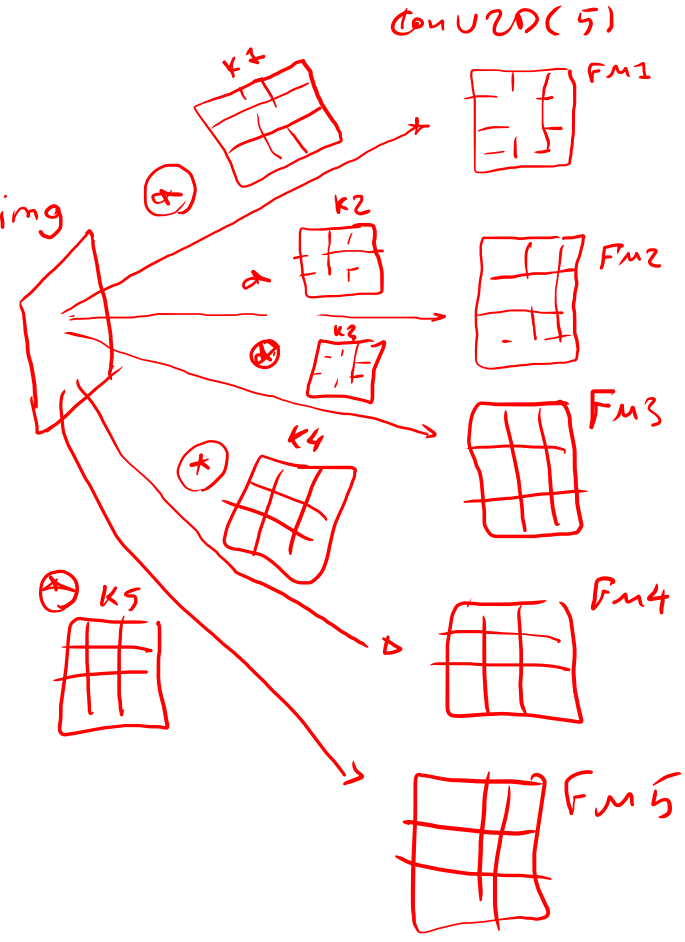
CNN - Coding

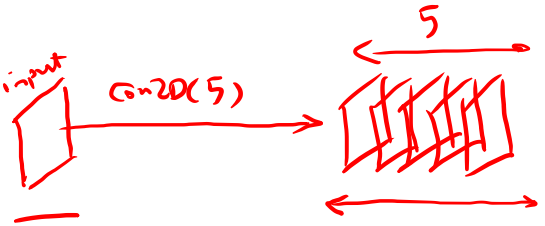

Dense
1D
input
Dense
0
0
0
output
0
0
0

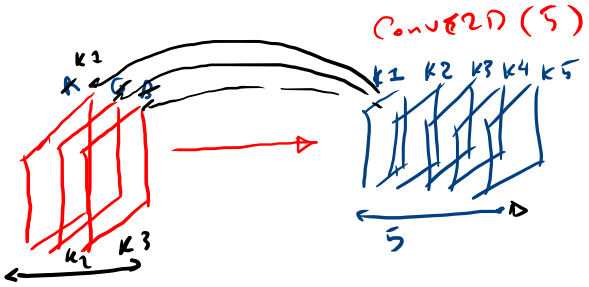

CNN


input
Kernels: 5
K=1
K3
K4
K5
K2
1
FM1
FM2
FM3
FM4
FM5



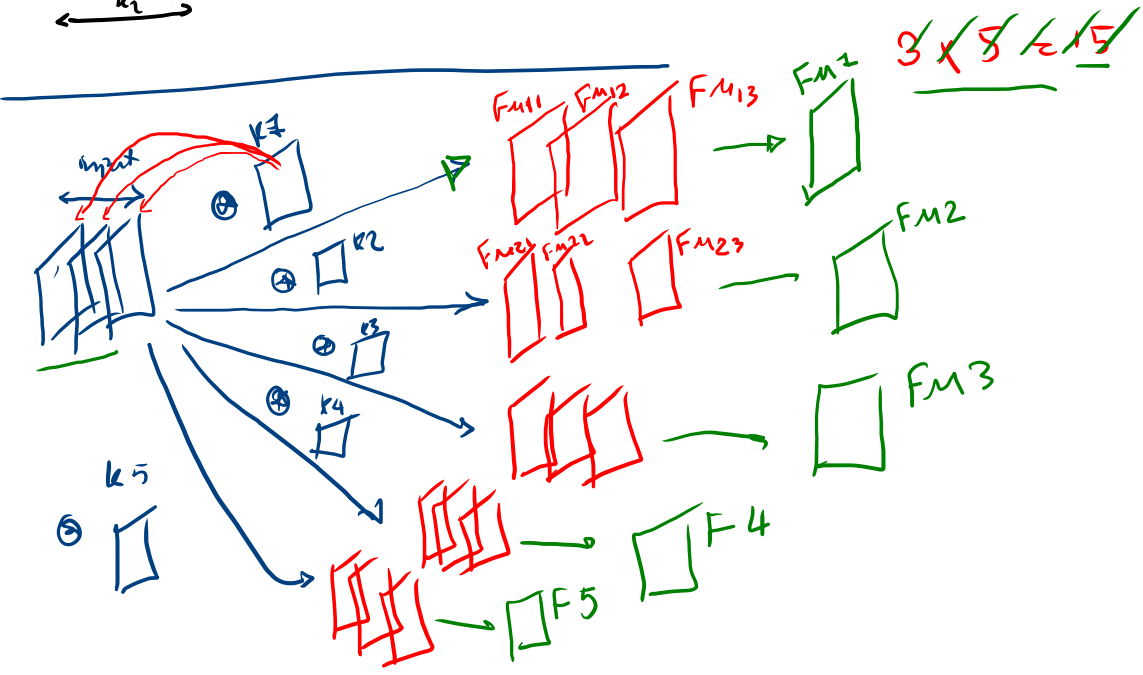

K=5 → FM = 5

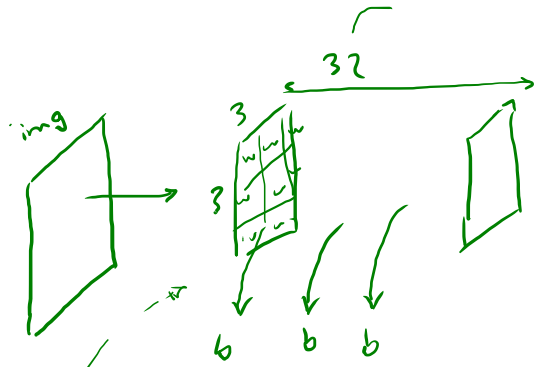





net > 0

net = $w_1 x_1 + w_2 x_2 + w_3 x_3 \cdots$





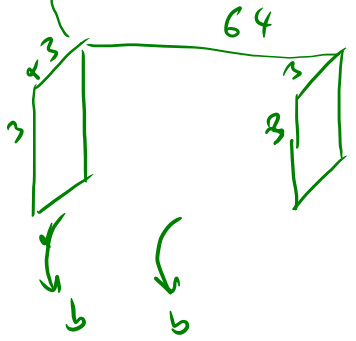

conv2D layer1

$32 \times 3 \times 3 = 288$

$288 + 32 = 320$

320

18496



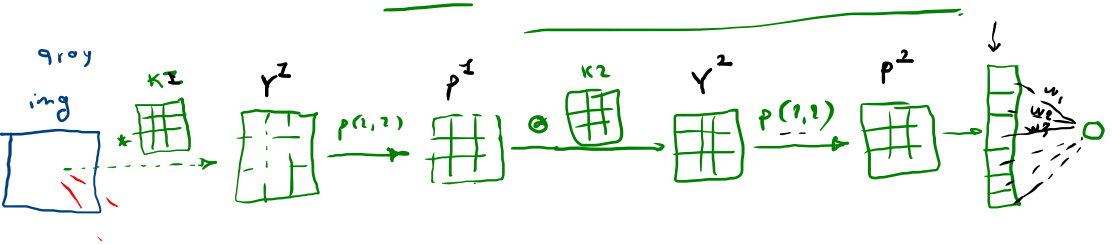

conv2D 2

$\rightarrow 64 \times 3 \times 3 = 567$

$\cdot \quad 567 \times 32 = 18432$

$18432 + 64 =$

# CNN Backpropagation




Conv2D(1, (3,3), P:Same)

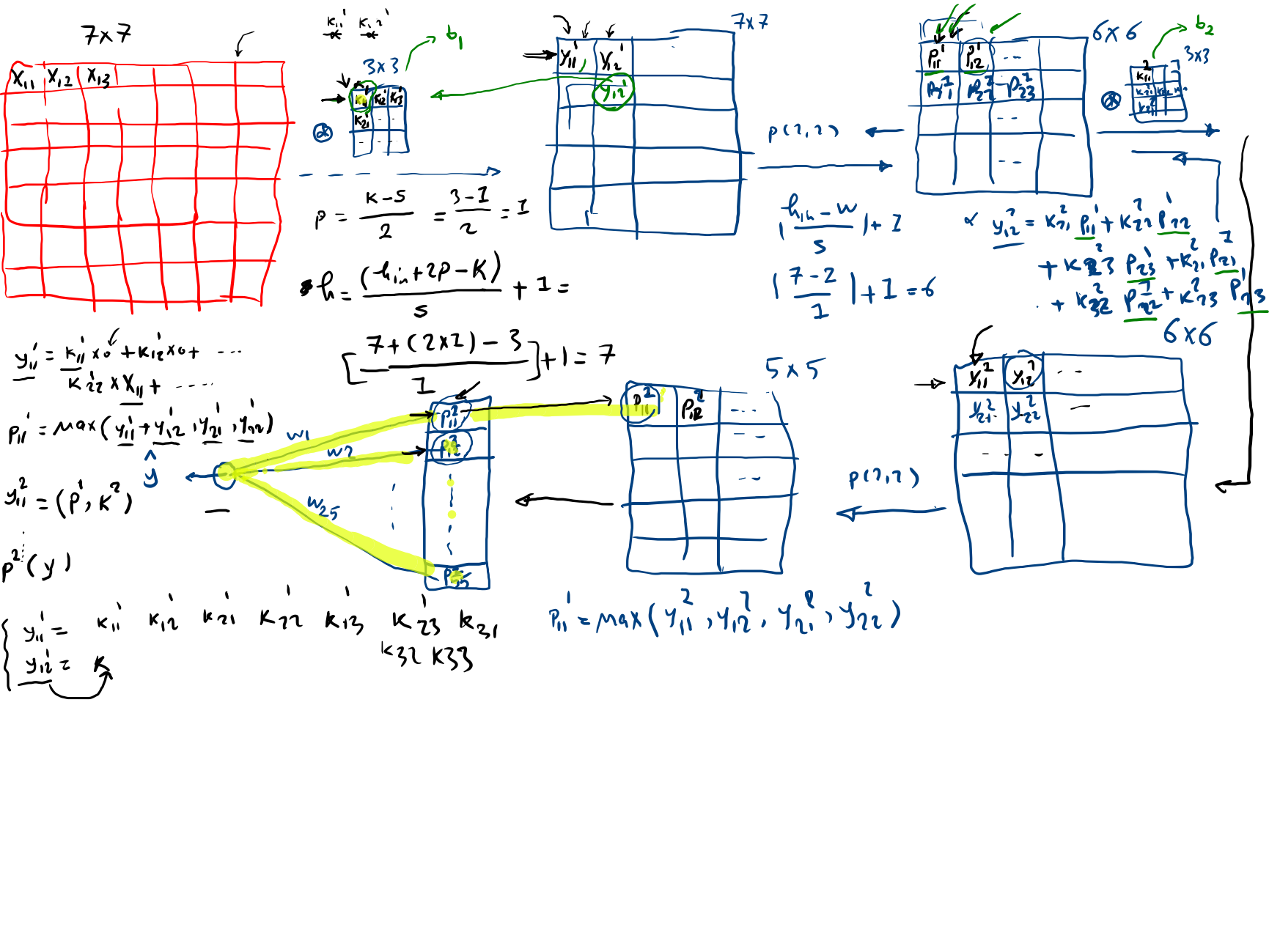
Maxpool((2,2))

→ Conv2D(1, (3,3), P:Same)

Maxpool((2,2))

→ Flatten()

Dense(1, Sigmoid)


7x7
3x3
b1
7x7
6x6
b2
3x3
p(?,?)
p = (K-S)/2 = (3-1)/2 = 1
h = (h_in + 2p - K)/s + 1 =
[(7+(2x1)-3)/1] + 1 = 7
|(h_in - w)/s| + 1
|(7-2)/1| + 1 = 6
y'_12 = k'_11 p'_11 + k'_12 p'_12 + k'_21 p'_21 + k'_22 p'_22 + k'_23 p'_23 + k'_31 p'_31 + k'_32 p'_32 + k'_33 p'_33
6x6
5x5
y'_11 = k'_11 x_0 + k'_12 x_0 + ... k'_22 x X_11 + ...
p'_11 = max(y'_11, y'_12, y'_21, y'_22)
y^2_11 = (p', k^2)
p^2(y)
w1
w2
w25
y
p(?,?)
{ y'_11 = k'_11 k'_12 k'_21 k'_22 k'_13 k'_23 k'_31 k'_32 k'_33
y'_12 = K
p'_11 = max(y^2_11, y^2_12, y^2_21, y^2_22)

$$K^1_{11\text{-new}} = K^1_{11\text{-old}} - \alpha \frac{\partial L}{\partial K^1_{11}}$$

$O: w_1 P^2_{11} + w_2 P^2_{12} + \cdots$

($P^2_{11}$ ← $K^1_{11}$, $P^2_{12}$ ← $K^1_{11}$)

$$\frac{\partial L}{\partial K^1_{11}} = \frac{\partial L}{\partial \hat{y}} \frac{\partial \hat{y}}{\partial O} \left[ \frac{\partial O}{\partial P^2_{11}} + \frac{\partial O}{\partial P^2_{12}} + \cdots \right]$$

$P^1_{11} = \max(y^1_{11}, y^1_{12}, y^1_{21}, y^1_{22})$

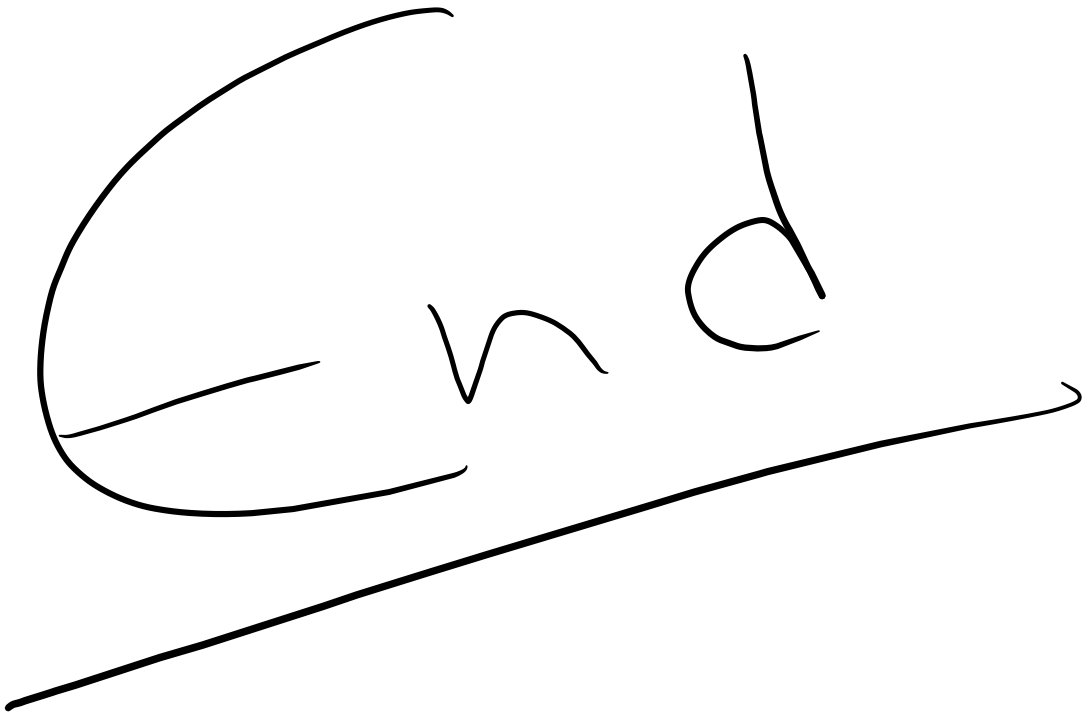
$P^2_{11} = \max(y^2_{11}, y^2_{12}, y^2_{21}, y^2_{22})$

$\max: y^2_{12}$

$$\frac{\partial O}{\partial P^2_{11}} \frac{\partial P^2_{11}}{\partial y^2_{12}} \left[ \frac{\partial y^2_{12}}{\partial P^1_{11}} + \frac{\partial y^2_{12}}{\partial P^1_{--}} + \frac{\partial y^2_{12}}{\partial P^1_{--}} + \cdots \right]$$

$$\frac{\partial y^2_{12}}{\partial P^1_{11}} \frac{\partial P^1_{11}}{\partial y^1_{12}} \frac{\partial y^1_{12}}{\partial K^1_{11}}$$

$y^1_{12} = K^1_{11} P^1_{--} + \cdots$


End