

$w^{(i)}$'s are equal to 1

$$J(\theta) = (X\theta - y)^T W (X\theta - y)$$

$$\frac{\partial J(\theta)}{\partial \theta}$$

$$= \frac{\partial ((X\theta - y)^T W (X\theta - y))}{\partial \theta}$$

$$= \frac{\partial ((X\theta)^T W X\theta - (X\theta)^T W y - y^T W X\theta + y^T W y)}{\partial \theta}$$

$$= \frac{\partial (X^T \theta^T W X\theta - X^T \theta^T W y - y^T W X\theta + y^T W y)}{\partial \theta}$$

$$= X^T \theta^T W X - y^T W X$$

$$\frac{\partial J(\theta)}{\partial \theta} = 0$$

$$\rightarrow X^T \theta^T W X - y^T W X = 0$$

$$X^T \theta^T W X = y^T W X$$

$$X\theta W^T X^T = y W^T X^T$$

$$\theta = (X^T W^T X)^{-1} W^T X^T y$$