

## Lecture 8

Show that  $\sigma'(y) = \sigma(y)(1 - \sigma(y))$

$$\sigma(y) = \frac{1}{1 + e^{-y}}$$

$$\frac{d}{dy} \sigma(y) = \frac{d}{dy} \left[ \frac{1}{1 + e^{-y}} \right] = \frac{d}{dy} (1 + e^{-y})^{-1} = - (1 + e^{-y})^{-2} (-e^{-y})$$

$$= \frac{e^{-y}}{(1 + e^{-y})^2} = \frac{1}{1 + e^{-y}} \cdot \frac{e^{-y}}{1 + e^{-y}} = \frac{1}{1 + e^y} \cdot \frac{(1 + e^{-y}) - 1}{1 + e^y} =$$

$$= \frac{1}{1 + e^y} \cdot \left( \frac{1 + e^{-y}}{1 + e^y} - \frac{1}{1 + e^y} \right) = \frac{1}{1 + e^y} \cdot \left( 1 - \frac{1}{1 + e^{-y}} \right) = \sigma(y) \cdot (1 - \sigma(y))$$