$$\frac{d\sigma(y)}{dy} = ?$$

$$\rightarrow \frac{d}{dy}(f(g(y))) = f'(g(y)) * g'(y)$$

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

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

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