4.7 From 4.59, we have:

$$\sigma(-a) = \frac{1}{1+\exp(-(-a))}$$
$$= \frac{1}{1+\exp(a)}$$
$$= \frac{1}{\exp(a)\ (\exp(-a)+1)}$$
$$= \frac{\exp(-a)}{1+\exp(-a)}$$
$$= \frac{1-1+\exp(-a)}{1+\exp(-a)}$$
$$= \frac{1+\exp(-a)}{1+\exp(-a)} - \frac{1}{1+\exp(-a)}$$
$$= 1 - \frac{1}{1+\exp(-a)}$$
$$\implies \sigma(-a) = 1-\sigma(a)$$

To prove the inverse of logistic sigmoid function, we prove the following:

$$\sigma\left(\ln\left\{\frac{y}{1-y}\right\}\right) = y$$
$$L.H.S = \frac{1}{1+\exp\left(-\left(\ln\left\{\frac{y}{1-y}\right\}\right)\right)}$$
$$= \frac{1}{1+\exp\left(\ln\left\{\frac{1-y}{y}\right\}\right)}$$
$$= \frac{1}{1+\left\{\frac{1-y}{y}\right\}}$$
$$= \frac{1}{\left\{\frac{y+1-y}{y}\right\}}$$
$$= \frac{1}{\left\{\frac{1}{y}\right\}}$$
$$= y$$

Thus proved both.