3. likelihood function: $L_i = p^{y_i}(1-p)^{1-y_i}$

a.

y	l_i
0	0.5
1	0.5

x	y
4	1
3	1
2	0
1	0

$$L(\beta) = \prod_{i=1}^{n} 0.5^{y_i}(1-0.5)^{1-y_i}$$

b.

$$\log L(\beta) = \log\left[\prod_{i=1}^{n} p^{y_i}(1-p)^{1-y_i}\right] = \sum_{i=1}^{n}\left[y_i \log(0.5) + (1-y_i)\log(0.5)\right.$$

$$= \sum_{i=1}^{n}\left(y_i \cdot \log(0.5) + (1-y_i)\cdot\log(0.5)\right)$$