Practical 1 – brief solution

1 maximize the log-likelihood by using `optim`. Note that the exact likelihood is not needed (can omit the constant term).

2 (a) Mean should be around 2, and variance/sd around 1. Use `mean`, `var` and/or `sd`

(b) Either use $\bar{x} \pm z_{\alpha/2}\sigma/\sqrt{n}$, or simulate from N(0, $\sigma/\sqrt{n}$) and check for percentile of observed mean, or simulate samples of size 64 from N(0,1) and count how often mean is greater than $\bar{x}$ or smaller than $-\bar{x}$. Should be around zero whichever method you use!

3 (a)

$$\prod_{i=1}^{18} exp(\beta_0 + \beta_1 z_i)^{x_i} exp(-exp(\beta_0 + \beta_1 z_i)n_i)$$

$$\propto \exp\left\{\sum_{i=1}^{18} x_i\,(\beta_0 + \beta_1 z_i)\right\} \quad exp - \left(\sum\nolimits_{i=1}^{18}\big(exp(\beta_0 + \beta_1 z_i)\big)n_i\right)$$

$$\propto exp\left(\sum_{i=1}^{18} x_i\,\beta_0 + \sum_{i=1}^{18} x_i\,\beta_1 z_i\right) exp\left(-\left(\sum_{i=1}^{18} n_i \exp{(\beta_0)} I(z_i = 0) + \sum_{i=1}^{18} n_i \exp{(\beta_0 + \beta_1)} I(z_i = 1)\right)\right)$$

$$\propto exp(330\beta_0 + 147\beta_1) \times exp(-285200\, exp(\beta_0) - 434900 exp\,(\beta_0 + \beta_1))$$