1. \((6+7+8)^3 = 63\)

2. because of correlation within a unit, tests of group need "error A". Add random unit (group) / test

3. \(6+7+8 = 21\)

4. a) \[ \text{Cov}(y_i) = \begin{pmatrix} \sigma_b^2 + \sigma_e^2 & \sigma_b^2 & \sigma_b^2 \\ \sigma_b^2 & \sigma_b^2 + \sigma_e^2 & \sigma_b^2 \\ \sigma_b^2 & \sigma_b^2 & \sigma_b^2 + \sigma_e^2 \end{pmatrix} \]
   \[ \text{Corr}(y_i) = \begin{pmatrix} 1 & p & p \\ p & 1 & p \\ p & p & 1 \end{pmatrix} \]
   \[ \sigma_b = \frac{\sigma_b^2}{\sigma_b^2 + \sigma_e^2} \]

b) \(\beta' = (\mu, \gamma_1, \gamma_2, \gamma_3, \gamma_1, \gamma_2, \gamma_3, \gamma_1, \gamma_2, \gamma_3, \gamma_1, \gamma_2, \gamma_3, \ldots, \gamma_1, \gamma_2, \gamma_3)\)

\[ X = \begin{pmatrix} 1 & \theta & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & \theta & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & \theta & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \]

5a) repeated time \((10, 20, 50)\) polynomial;

b) \(H_0: \mu_1 = \mu_2 = \mu_3 \quad \mu' = (\mu_1, \mu_2, \mu_3)' \quad l = 1, 2, 3\)

d) \(H_0: \mu_1 = \mu_2 = \mu_3, \mu_2 = \mu_3, \mu_1 = \mu_3, \mu_1 = \mu_3\)
Group 3 means are approx. constant over time. Clearly, Group 2 improves a lot in the first 3 weeks then possibly at a slower rate.

Group 1 appears to improve some, especially in the first 3 weeks. Hard to distinguish Groups 1 and 2. Group 2 is clearly lower than 1.

Variance: 62 45 35 17 30 14 9 2.5 1.6 1.6 Group 2 is the lowest variance.

47 27 22 21 31 Then Groups 1 and 3 at least for last 4 measurements. All seem

Correlations are pretty random. to decrease a bit over time.

Recall \( r = \frac{1 - r^2}{\sqrt{m-3}} \). Hard to see a pattern.

7. AIC chooses \( \text{type} = \text{csh} \) group=group

BIC chooses \( \text{type} = \text{csh} \) but just barely. I'll went with.

8. \( \text{cov} = \begin{pmatrix} 23.4 & 9.3 & 9.3 & 9.3 & 9.3 \\ 23.4 & 9.3 & 9.3 & 9.3 \\ 23.4 & 9.3 & 9.3 \\ \end{pmatrix} \) \( \text{cor} = \begin{pmatrix} 1 & p & p \\ p & 1 & p \\ p & p & 1 \end{pmatrix} \)

\[ p = \frac{9.722}{9.722 + 14.066} = .40 \]
9a) \[ \hat{Y} = 102.47 - 0.3039 \text{day} + 0.002703 \text{day}^2 \quad \text{Group 1} \]
\[ \hat{Y} = 100.64 - 0.4095 \text{day} + 0.002643 \text{day}^2 \quad \text{Group 2} \]
\[ \hat{Y} = 97.28 + 0.03458 \text{day} - 0.00058 \text{day}^2 \quad \text{Group 3} \]

b) Est. 5: \[ t = -2.05 \quad p = 0.0451 \]

c) Est. 7: \[ t = 0.05 \quad p = 0.9610 \]

d) \[ F = 12.64 \quad p < 0.0001 \]

e) Contrast 3: \[ F = 3.18 \quad p = 0.0505 \]

f) Looking at "Solution for Fixed Effects", the linear and quadratic terms for Group 3 can be dropped. Also, we could let intercepts be equal (from contrast 1). Also, we could let the quadratic slopes for Groups 1 and 2 be equal (est. 7).

g) estimate 'Group 1 = Group 2 at day 84',

\[ \text{group 1} - 1.0 \text{ day x group} \quad 84 - 84.0 \]
\[ \text{day x group} \quad 7056 - 7056.0 \]

\[ 84.2 = 7056 \]